63

PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 2324–2519

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12.25 2324

On the mathematically significant figures in the solution of simultaneous linear equations. TUCKERMAN, L. B. *Ann. Math. Statist.*, 12, *pp.* 307–316, 1941.—Expressions are given for estimating the computational errors incurred in the solution of a system of equations whose coefficients are subject to error. In many problems the computation of some of the unknowns must be carried to more significant figures than are determinate in the determinant of the system. Examples are given. [See Abstr. 2325 (1944)]. L. S. G.

12.25 2325

Systems of linear equations with coefficients subject to error. LONSETH, A. T. *Ann. Math. Statist.*, 13, *pp.* 332–337, *Sept.*, 1942.—Let

$$\sum_{j=1}^{n} a_{ij}x_j = c_i \ (i = 1, \ldots, n)$$

be written in the matrix form $\mathbf{AX} = \mathbf{C}$. The principal result of the paper is the Taylor expansion of the error in any unknown, considered as a function of the $n(n+1)$ errors in the coefficients. Suppose the errors α_{ij} in a_{ij} form the matrix $\mathbf{H}$ and the errors γ_i in c_i the column vector $\mathbf{K}$. If $\mathbf{Y}$ is the vector consisting of the errors $\xi_1, \ldots, \xi_n$ in $x_1, \ldots, x_n$ we have

$$(\mathbf{A} + \mathbf{H})(\mathbf{X} + \mathbf{Y}) = \mathbf{C} + \mathbf{K}$$

If we write $\mathbf{M} = \mathbf{A}^{-1}\mathbf{K}$, $\mathbf{N} = -\mathbf{A}^{-1}\mathbf{H}$, the equation may be solved by iteration to give $\mathbf{Y} = \sum_{K=1}^{\infty} \mathbf{Y}^{(K)}$

where $\mathbf{Y}^{(1)} = \mathbf{M} + \mathbf{NX} = \mathbf{A}^{-1}(\mathbf{K} - \mathbf{HX})$

$\mathbf{Y}^{(K)} = \mathbf{NY}^{(K-1)} = -\mathbf{A}^{-1}\mathbf{HY}^{(K-1)}$ $(K > 1)$.

The errors $\xi_1, \ldots, \xi_n$ are thus found. To examine the convergence and to set up an upper limit for the ξ's, suppose $|\alpha_{ij}|, |\gamma_i| \leqslant \delta$, and write $\rho = \dfrac{\delta}{|\mathbf{A}|}\sum_{i,j}|A_{ij}|$

where A_{ij} is the co-factor of a_{ij} in $\mathbf{A}$. Convergence is ensured if $\rho < 1$, that is, $|\alpha_{ij}| \leqslant \delta < |\mathbf{A}|/\sum_{i,j}|A_{ij}|$, and, in that case, $|\xi_j| \leqslant \dfrac{\delta}{|\mathbf{A}|}(1 + \sum_i |x_i|)(\sum_i A_{ij})/(1-\rho)$.

Thus not only approximations to the maximum error, but an actual upper limit is found. L. S. G.

512.25 : 518.12 2326

On methods of solving normal equations. HOEL, P. G. *Ann. Math. Statist.*, 12, *pp.* 354–359, 1941.—The well-known methods of Chio, Gauss, Doolittle and Aitken, and a recent method of Albert, are discussed and compared from the point of view of the computer, both as regards the number of necessary operations and the amount of copying. It is concluded that the Doolittle method is preferable for solving a set of normal equations or for the calculation of the inverse of a symmetric matrix; but Aitken's method is better for non-symmetrical equations. L. S. G.

512.31 : 518.5 *see Abstr.* 2329

512.831 : 513.88 : 519.48 *see Abstr.* 2336

512.972 : 531.225 *see Abstr.* 2382

513.88 : 512.831 : 519.48 *see Abstr.* 2336

517.93 = 4 2327

On a system of differential equations studied by Störmer. MALMQUIST, J. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 5, 8 *pp.*, 1944.—The equations define the trajectories of electrical particles in space under the influence of the earth's magnetism. It is of interest to know whether there exist trajectories passing through the origin. Störmer found this plausible from some numerical calculations. It is proved rigorously that such trajectories exist, by applying some analytical results relating to equations of the form

$$x^{h+1}dy_i/dx = P_i(x, y_1, \ldots, y_n) \ (i = 1, \ldots, n)$$

where h is a positive integer and $P_1, \ldots, P_h$ are power series. L. S. G.

517.941.9 2328

On the perturbation of boundary conditions. FESHBACH, H. *Phys. Rev.*, 65, *pp.* 307–318, *June* 1 *and* 15, **Errata,** 66, *p.* 157, *Sept.*, 1 *and* 15, 1944.—The solution of the scalar and vector wave equations in regions bounded by irregular surfaces which have non-uniform physical properties is reduced to the solution of a secular equation. The secular determinant is Hermittian. The solution to the secular equation is expressed in a form suitable for obtaining its value to any approximation. Similar results are given for the corresponding eigenfunctions. Extension of these results to the problem of scattering and to the situation where the bounding surfaces move is indicated.

518.12 : 512.25 *see Abstr.* 2326

518.5 : 512.31 2329

On mechanical tabulation of polynomials. MCPHERSON, J. C. *Ann. Math. Statist.*, 12, *pp.* 317–327, 1941.—It is shown how automatic accounting machines may be used for the preparation of tables of integral powers, of polynomials and of functions which can be approximated by polynomials. The main feature of the method is the computation of summed products or of summed powers by means of successive cumulated additions. The use of a punched-card table for the automatic calculation of polynomial coefficients is discussed and it is shown how tables may conveniently be subdivided [Abstr. 16 (1944)]. L. S. G.

519.2 2330

On the foundations of probability and statistics. MISES, R. VON. *Ann. Math. Statist.*, 12, *pp.* 191–205, 1941.—An outline of ideas of the theory of probability developed since 1919. The discussion begins with the notion of collective, examples being given. Place selections and randomness are treated and the concept of probability as a measure of a set (due essentially to Kolmogoroff) is dealt with. This concept is supplementary to, but not a substitute for, the author's theory. The final section deals with statistical estimation, particular attention being paid to the confidence interval method. L. S. G.

519.2 : 519.53 2331

Probability as measure. DOOB, J. L. *Ann. Math. Statist.*, 12, *pp.* 206–214, 1941.—A theory of proba-

bility is outlined, in which a formal calculus is set up to deal with probability numbers. The approach is from the standpoint of the measure of a set of points in an infinite dimensional space, each point being considered as a logically possible sequence of results of a given experiment. Various theorems are proved which enable the calculus to be applied. L. S. G.

519.217 2332

On linear estimation and testing of hypothesis. RAO, C. R. *Curr. Sci.*, 13, *p.* 154, *June*, 1944.

519.27 2333

Determination of sample sizes for setting tolerance limits. WILKS, S. S. *Ann. Math. Statist.*, 12, *pp.* 91–96, 1941.—Let x be a random variable having any unknown continuous distribution $f(x)$ and a given degree of stability. A method is given, based on truncated sample ranges, for determining the size of sample required for setting tolerance limits on x. A method for setting tolerance limits when $f(x)$ is normal is discussed and a comparison is made of the stabilities of the tolerance limits set by the two methods in the normal case. L. S. G.

519.271 2334

A note on the generalized variance of multivariate populations. IYER, P. V. K. *Curr. Sci.*, 13, *p.* 125, *May*, 1944.—Gives the relationship between the generalized variance and the residual variances, on the basis of the size of the sample and not on the degree of freedom, of the regression equations between the various variables.

519.443 = 3 2335

The structure of extended Abelian groups. BERGSTRÖM, H. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 4, 10 *pp.*, 1944.—Two theorems are proved which characterize extended Abelian groups. One of these may be enunciated thus: Let A be a direct product of l cyclic groups P_i of order n, Γ a group containing a subgroup Γ_0 of index l, Ω a group containing a cyclic normal subgroup Z of order n and $\Gamma_0 \simeq \Omega/Z$. Then there exists, to within an isomorphic group, one and only one extension G of A through Γ, and G possesses the following properties: if N_1 is the normalizer of P_1 in G then G may be mapped homomorphically upon Γ so that G/A and N_1/A are isomorphic with Γ and Γ_0 respectively; and N_1 may be mapped homomorphically upon Ω so that $N_1/P_2 \times \ldots \times P_l$ and $A/P_2 \times \ldots \times P_l$ are isomorphic with Ω and Z, respectively. An application of the theorems to Galois fields is given. L. S. G.

519.48 : 513.88 : 512.831 2336

Maximum matrix rings. ALLEN, H. S. *J. Lond. Math. Soc.*, 18, 3, *pp.* 142–147, 1943.—A set S of (infinite) matrices is a ring when, for every A, B, C in S (i) $\sum_i |a_{ni}b_{ik}|$ is convergent, (ii) AB is in S, (iii) $A(BC) = (AB)C$, (iv) $A + B$ is in S. A matrix ring is max. when it is not part of any other ring. Necessary and sufficient conditions are given for a matrix ring to be maximum. Of particular importance are sequence spaces Σ (if x and y are in Σ and r is a complex number, then $x + y$ and rx are in Σ) examples of which are (1) ϕ, the space of all sequences in which $x_k \neq 0$ for a finite number of values of k only; (2) Γ, the space of all convergent sequences; (3) σ_1, in which $\sum|x_k|$ is convergent; (4) σ_∞ the space of all bounded sequences. L. S. G.

519.53 : 519.2 *see Abstr.* 2331

522.26 2337

Adjusting the polar axis. WATES, C. G. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 154–162, *April*, 1944.—A method is described of adjusting the polar axis of a telescope with a double-yoke mounting in which the tube cannot be reversed end for end. The declination scale is first set to give correct readings for equatorial stars on the meridian. Then the apparent declination of 2 stars is read off, one 3 hr. east and the other 3 hr. west of the meridian. The observed errors are substituted in 2 formulae which are then solved for the direction and amount of the tilt required by the polar axis. Instructions are also given for adjusting the declination axis at rt. angs. to the polar axis, and for squaring the reflecting prism with the objective and eyepiece. A. HU.

522.3 2338

Preliminary results of tests of and observations with the reversible transit circle of the Royal Observatory, Greenwich. JONES, H. SPENCER, AND CULLEN, R. T. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 146–162, 1944.—The instrument is fully described. Tests of the figure of the pivots showed errors which were corrected by controlled lapping. The construction of the micrometer eye-end was modified to eliminate errors due to faulty fixture of the frame carrying the moving wire and to lag of the moving wire. The diurnal and seasonal changes of the errors of collimation, level and azimuth, are investigated, and the importance of a close control over the error of collimation is emphasized. The work leads to some recommendations on the housing of meridian instruments. A. HU.

522.55 2339

Artificial illumination of telescope fields. ATKINSON, R. D'E. *Observatory*, 65, *pp.* 194–195, *June*, 1944.—The ordinary light-field illumination of transit instruments is unsatisfactory because the solid angle of the beam of starlight is completely different from that of the field illumination. Identical superposition of the 2 beams is achieved by placing the diffuser facing the objective and forming its real image, with the outer surface of the objective, in the focal plane of the telescope. A. HU.

522.56 : 535.33.072 *see Abstr.* 2417

523.32 : 551.594.6 : 525.23 *see Abstr.* 2372

523.441 2340

Observations of Eros at the Cape Observatory in 1938 and 1942. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 195–197, 1944.—Photographically observed positions of Eros are given for 1938 and 1942, and the latter are compared with an accurate ephemeris. A. HU.

523.45 : 535.7 2341

The training of the eye in visual planetary astronomy. JOHNSON, H. M. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 189–192, *May–June*, 1944.—The increase of visual acuity with practice in an observer previously untrained in planetary work is illustrated by sketches of Jupiter made during 1937 with mediocre instrumental equipment. The improvement is confined to the eye actually used, and is believed to be accompanied by

n enhanced appreciation of colour, to be retained for ome months, and to be transferable to other planets ut not to all celestial objects. A. HU.

523.46 2342

Observations of Saturn, 1939–43. HAAS, W. H. *. Roy. Astr. Soc. Can.*, 38, *pp.* 177–188, *May–June*, 944.—A report of observations (mostly visual) of the lanet at 4 different apparitions by 10 observers using elescopes of apertures ranging from 4 in. to 18 in.

A. HU.

523.53 2343

The luminous path of meteors. MCINTOSH, R. A. *. Roy. Astr. Soc. Can.*, 38, *pp.* 193–200, *May–June*, 944.—The path length of a meteor, sporadic or hower, is shown to be dependent on its angle of ncidence to the atmosphere, the correlation coefficient eing $r = -0{\cdot}42 \pm 0{\cdot}02$. A similar dependence xists ($r = +0{\cdot}37 \pm 0{\cdot}01$) betw. magnitude and ath length, possibly because increased atmospheric bsorption obscures the fainter meteors; but the eights are not correlated with inclination. Criticisms y Porter (Abstr. 2491 (1943)] of the suitability of Denning's data for statistical analysis are refuted.

A. HU.

523.61 2344

Comets, 1943. DAVIDSON, M. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 108–109, 1944.—Progress eport. A. HU.

523.74 2345

Some problems of the outer layers of the Sun. REDMAN, R. O. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 99–107, 1944.—Theories of the formation of Fraunhofer lines must be tested by making observations of the darkening to the limb both in the continuous spectrum and in the lines themselves. No simple model atmosphere yet proposed fits the observations satisfactorily, but the observations themselves are not certainly free from the effect of scattered light. Turbulent velocities from observed line widths do not exceed 1 km./sec., either in the reversing layer or in the lower chromosphere. The observed granulation of the photospheric surface accords well with the "roughness" which must be postulated to explain eclipse observations of the spectrum just within the limb, and may be related to the hydrogen convection currents which transport most of the energy in the layer underneath the surface. The line profiles in the inner corona give a kinetic temperature of $2\frac{1}{2} \times 10^6$ deg., in close agreement with the ionization level demanded by Edlén's mechanism of their production. A. HU.

523.746 2346

Sunspots, 1943. NEWTON, H. W. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 108–109, 1944.—Progress report. A. HU.

523.746 : 538.12 2347

A theoretical note on the magnetic field of a circular sunspot. CHAPMAN, S. *Terr. Magn. Atmos. Elect.*, 49, *pp.* 37–42, *March*, 1944.—A sunspot is considered as one end of a vortex tube constituting a semi-toroidal electromagnet. The magnetic field and flux due to such an idealized spot are calculated assuming the solar matter to be non-magnetic. For a given distribution of current intensity in the electromagnet, the magnitude of the field and its inclination to the solar radius across the surface of the spot are compared with the values observed on the Sun. A. HU.

523.746.5 2348

An estimate of the trend of solar activity, 1944–50. SHAPLEY, A. H. *Terr. Magn. Atmos. Elect.*, 49, *pp.* 43–45, *March*, 1944.—Assuming that each sunspot cycle is a recurrence of a phenomenon of std. pattern, the epoch of the coming min. is estimated by Brunner's formulae as 1944.9 and that of the next max. as 1949.6. The height of max. is given as 80 compared with the 119 of 1937. Curves are given showing how the estimated epochs may be expected to vary with the height of max. A. HU.

523.752 2349

Prominences, 1943. NARAYAN, A. L. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 109–110, 1944.—Progress report. A. HU.

523.752 2350

The temperature of the solar chromosphere. PETRIE, W. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 137–142, *April*, 1944.—Deviations from thermodynamic equilibrium in a stellar atmosphere lead to different estimates of its temperature from different lines of approach. The connection betw. the notions of colour temperature, effective temperature, electron temperature, ionization temperature and excitation temperature is explained. Data obtained during the 1936 eclipse show that the solar chromosphere is not in thermodynamic equilibrium, the excitation temperature found from a given exposure on the chromospheric spectrum being a function of the excitation potential of the lines used in deducing it. A temperature range of 1 500°C. is found for the metallic atoms. The range betw. one exposure and the next is negligibly small, indicating that the variation of temperature with chromospheric height is small for the metals. A. HU.

523.755 2351

The solar eclipse of 1936 June 19. VSESSVIATSKY, S., AND BOUGOSLAVSKY, E. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 140–145, **Errata**, 104, 4, *p.* 240, 1944.—Coronal photographs obtained at 4 stations in the path of the eclipse, separated by a total interval of 2 hr., are compared. The structure of the inner corona is described and illustrated, and changes which occurred in it during the 2 hr. period are traced. The coronal arches and the fans associated with them are connected with eruptive processes on the solar surface. Helmet-shaped summits to the fans suggest the presence of vertical fields as far as 2 radii from the surface. Comparison with earlier eclipse photographs shows that the inclination of the axes of the fans to the surface is 90° at max. activity but only 55° at min. An equatorial belt of the corona 7° wide shows less luminosity than the rest.

A. HU.

523.774 2352

Line intensities and the solar curve of growth. WRIGHT, K. O. *Astrophys. J.*, 99, *pp.* 249–255, *May*, 1944.—Theoretical intensities based on LS coupling are compared with laboratory absorption intensities for Ti I and Fe I. The agreement is good in the mean, but a large scatter is attributed to the failure of LS coupling to represent the electron interaction. Equiv. widths of about 700 solar lines of these atoms in the region 3 500–6 700 Å are therefore combined with

laboratory intensities, not theoretical ones, to redetermine the curve of growth. Excitation temperatures of 4 550°K. ± 125°K. and 4 900°K. ± 125°K. are found for Ti I and Fe I respectively; the difference is probably real. The scatter of individual points about the mean curve of growth is much reduced by the use of accurate intensities. The observed curve is compared with the theoretical one. A. HU.

523.774.6 : 538.615 2353

The magnetic effect in sunspot spectra. EVERSHED, J. *Observatory*, 65, *pp.* 190–193, *June*, 1944.—Observations on the Zeeman splitting of 2 iron lines in the sunspot spectrum, at 5 250 Å and 6 173 Å, are described. These lines appear as triplets in the umbrae but as doublets in the penumbrae of spots, and thus seem not to behave in the Sun as they do in the laboratory. Difficulties are pointed out in the theory which attributes the magnetic field of a spot to vortical motion of ionized gases. The motion observed parallel to the surface and radial to the spot cannot explain the field in the penumbra, and the relevance to current theory of the general rise of low-level Fe and descent of high-level Ca is as yet unknown. A. HU.

523.832 2354

Radial velocities of proper-motion stars. MÜNCH, G. *Astrophys. J.*, 99, *pp.* 271–272, *May*, 1944.—Radial velocities are determined for 39 stars of large proper motion, and new spectral types are assigned to all except the M dwarfs and white dwarfs. Three dwarfs show H and K in emission, and one also shows the Balmer lines in emission. A. HU.

523.841.11 : 523.872 2355

The spectrum of Nova Puppis 1942. WEAVER, H. F. *Astrophys. J.*, 99, *pp.* 280–294, *May*, 1944.—From a series of McDonald spectrograms of this "fast" nova taken betw. Nov., 1942, and May, 1943, its evolution is described. Measured wavelengths, expansion velocities and identifications are tabulated; different velocities in the lines of different elements suggest stratification in the nova shells. The most unusual feature is the occurrence of forbidden Fe II lines, hitherto observed only in "slow" novae. A. HU.

523.841.3 : 523.872 2356

Note on the spectrum of α^2 Canum Venaticorum. HILTNER, W. A. *Astrophys. J.*, 99, *pp.* 256–257, *May*, 1944.—Doubling is reported in the Fe II line at 4 233 Å, and in certain other lines of type B, in α^2CVen at a phase near Eu II max. The duplicity cannot be explained by binary motion, and it is suggested that emission occurs in the centre of the lines, as in ε UMaj [Abstr. 61 (1944)]. A. HU.

523.841.3 : 523.872 2357

The spectrum variable ϵ Ursae Majoris. SWENSSON, J. W. *Astrophys. J.*, 99, *pp.* 258–270, *May*, 1944.—A list is given of wavelengths, intensities and identifications for absorption lines in ε UMaj betw. 3 307 Å and 4 638 Å. The periodic variation in the intensities is described. A. HU.

523.841.9 2358

On the smaller effects in eclipsing variables. MARTINOFF, D. J. *Astrophys. J.*, 99, *p.* 313, *May*, 1944.—A summary by S. Gaposchkin of a Russian paper which examines the possibility of determining, from the light curves of eclipsing variables, the dissimilarity of the components, the orientation of their axes, and the reflection effect. By computing light curves for hypothetical eclipsing systems, first with similar components and then with dissimilar ones, it is shown that the differences do not exceed 0·02 mag., or less if limb darkening is taken into account. A new formula for rectifying the reflection effect is deduced. It is concluded that many of the smaller effects deduced from existing light curves are spurious and result from over-discussion of the data. A. HU.

523.841.9 2359

The reflection effect in eclipsing variables. ODINZOV, M. G. *Astrophys. J.*, 99, *pp.* 314–316, *May*, 1944.—A summary by S. Gaposchkin of a Russian paper dealing with the geometry of the reflection effect. Formulae based on the Milne expression are derived for the change of reflection with phase, and for the displacement of the c.g. of the reflected radiation, considering both spherical and ellipsoidal stars, with their axes in and out of alignment. The periastron effect cannot be explained by a lack of alignment of ellipsoidal components. The formulae are tested by comparing computed and observed reflection effects. A. HU.

523.841.9 : 523.872 2360

The spectrum of RX Cassiopeiae. STRUVE, O. *Astrophys. J.*, 99, *pp.* 295–312, *May*, 1944.—The spectrum of this eclipsing variable is composite: gG3 + gA5e. Velocity curves from the lines of the G3 star, which is in front at principal eclipse, disagree with curves derived for the A5 component, the discrepancies resembling those observed in SX Cass [Abstr. 1251 (1944)]. It is suggested that the G3 star eclipses a stream of approaching gas around the A5 star before mid-eclipse, and a stream of receding gas after mid-eclipse. Many features of the A5 spectrum are produced in this stream and not in a normal reversing layer. A re-discussion of the light curve leads to the conclusion that the eclipse may be nearly grazing. The analogy with SX Cass is disturbed only by the fact that in RX Cass the light of the G star predominates, whereas in SX Cass the A star is brighter except near principal mid-eclipse. A. HU.

523.842.2 2361

Double stars, 1943. BOS, W. H. VAN DEN. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 110–111, 1944.—Progress report. A. HU.

523.842.3 2362

The spectrographic orbit of HD 34762. STILWELL, W. H. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 163–170, *April*, 1944.—From 146 measures on 69 radial-velocity plates taken betw. 1919 and 1941, orbital elements are calculated from 12 normal places, by Sterne's method [Abstr. 1189 (1941)], assuming a preliminary circular orbit and then correcting to a final ellipse. Data concerning the masses, luminosities and dimensions of the components, are deduced from statistical considerations and from the fact that the secondary spectrum is not visible, using reasonable assumptions for the relative masses. A. HU.

523.842.3 2363

The Wolf–Rayet spectroscopic binary HD 214419. HILTNER, W. A. *Astrophys. J.*, 99, *pp.* 273–279, *May*, 1944.—Velocity curves of this star are obtained

from 50 spectrograms taken on the McDonald 82 in. reflector in Nov. and Dec., 1943. The curve for the N IV line at 4 058 Å gives elements which are totally different from those derived from the He II line at 4 686 Å. It is suggested that the radial velocities shown by the latter represent more than orbital motion, since it is the only line which shows a peculiar velocity variation, and its structure varies during the cycle. Photometric observations suggest a variation of 0·20 magnitude, with the star brightest when the Wolf–Rayet component is on the far side of the system. No evidence of an eclipse is detected. A. HU.

523.842.3 : 523.872 2364

Note on the spectrum of 12 Comae Berenices. CESCO, C. U., AND SAHADE, J. *Astrophys. J.*, 99, *p.* 317, *May*, 1944.—Ultra-violet spectrograms of this spectroscopic binary (gF4 + A) show metallic lines of velocity corresponding to that of the F star, except the K line, whose velocity is close to that expected for the secondary. It is concluded that strong absorption at the confluence of the Balmer lines and in the Balmer continuum weaken the A spectrum sufficiently to leave the F lines alone visible. A. HU.

523.851.2 : 523.854.1 2365

Galactic and extragalactic studies. XVII. Revision of the distances of 30 high-latitude globular clusters. SHAPLEY, H. *Proc. Nat. Acad. Sci., Wash.*, 30, *pp.* 61–68, *March*, 1944.—[See Abstr. 1008 (1943)]. The distances of 30 globular clusters away from the galactic plane are revised, using new photometric data and new estimates of space absorption from the background galaxies. The new distances are consistent with the previous estimate of 10 000 parsecs betw. the Sun and the centre of the Galaxy. The overall thickness of the system of globular clusters exceeds 40 000 parsecs. The average integrated luminosity of a cluster is − 7·5 mag., about the same as that of the nucleus of a spiral nebula. It may be that a galaxy, on losing its spiral arms, develops into a globular cluster. A. HU.

523.851.3 2366

A photographic survey of galactic clusters. V. NGC 189, I 1590, NGC 358, 366, 381, 433, 436, 457, 609, 637, I 166, NGC 743. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 179–190, 1944.—An extension of previous work [Abstr. 2131 (1943)] to the clusters named. A. HU.

523.851.3 2367

A photographic survey of galactic clusters. VI. The cluster group in Cassiopeia. ALTER, G. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 191–194, 1944.—The constitution of this group of 19 clusters is investigated. There are 2 condensations of 6 clusters each, at about 1 280 and 2 170 parsecs. The relation betw. apparent space density and distance is shown graphically. The random distribution of colour excesses suggests that the observed obscuration is due to a number of small, scattered clouds. A. HU.

523.854.1 : 523.851.2 *see Abstr.* 2365

523.854.12 : 523.854.3 *see Abstr.* 2368

523.854.3 : 523.854.12 2368

An analysis of the motions of Cepheid variable stars, with reference to galactic rotation and absorption. CAMM, G. L. *Mon. Not. Roy. Astr. Soc.*, 104, 3, *pp.* 163–178, 1944.—The radial velocities of 142 of the nearer Cepheids are analysed for solar motion and differential galactic rotation. The Oort constant *A* is significantly smaller for regions towards the galactic centre than for other directions. This is interpreted as an effect of absorption, and corrections are applied to the distances used amounting to 1·36 and 0·52 mag./kpc. for the sectors towards and away from the centre respectively. The galactic centre is at a distance of 9 030 ± 840 pc. in longitude 325°·4 ± 1°·7. Examination of the proper motions of 85 Cepheids confirms the present zero-point of the period/luminosity law and gives a value of (370 ± 43) km./sec. for the Sun's speed of galactic rotation. A. HU.

523.855 2369

The nature of the galaxies. MORGAN, F. P. *J. Roy. Astr. Soc. Can.*, 38, *pp.* 201–208, *May–June*, 1944.—The author's hypothesis [Abstr. 1323 (1943)] concerning the distribution of dust in a galaxy is extended. If, as the change of spectrum and colour index suggests, the density of dust and gas increases away from the nucleus of a galaxy, the uniform rotation period can be explained, and the arrangement of the stars into a spiral pattern will be dynamically stable. Reasons are given for believing that the Sun is outside the region of spiral structure in our own Galaxy. A. HU.

523.872 2370

Complex lines in the spectrum of θ Aurigae. HILTNER, W. A., AND MORGAN, W. W. *Astrophys. J.*, 99, *p.* 318, *May*, 1944.—At times the Cr II lines in this spectrum are unusually strong and show a complex structure, some appearing double. The effect cannot be explained by postulating a binary system, as the spectrum is never observed with sharp single lines; it is probably associated with the atmosphere of a single star. A. HU.

523.872 : 523.841.11 *see Abstr.* 2355

523.872 : 523.841.3 *see Abstr.* 2356, 2357

523.872 : 523.841.9 *see Abstr.* 2360

523.872 : 523.842.3 *see Abstr.* 2364

523.872 : 535.343.4 2371

The continuous absorption coefficient of the negative hydrogen ion. HENRICH, L. R. *Astrophys. J.*, 99, *pp.* 318–319, *May*, 1944.—A correction to a previous paper [Abstr. 1258 (1944)] which involves minor numerical changes in the absorption coefficient. A. HU.

525.23 : 551.594.6 : 523.32 2372

On the observational evidence for changes in ionization of the upper atmosphere attributable to the moon. STETSON, H. T. *Terr. Magn. Atmos. Elect.*, 49, *pp.* 9–24, *March*, 1944.—Analysis of 18 000 hr. of field-intensity measurements extending over 8 yr. shows a marked relation betw. the age of the moon and radio transmission on 770 kc./s. betw. Chicago and Boston, the field strength showing max. values at moon ages of about 12 days and 24 days. Two separate 4 yr. series of observations made with the moon above the horizon show the effect clearly, whereas data collected when the moon was down show no effect. The results are tentatively attributed to the effect on the ionosphere of photo-electrons

expelled from the unprotected lunar surface by high-energy radiation from the Sun. A. HU.

526.918.5 = 3 2373

Triangulation by photogrammetric means. VÖGELI, R. *Schweiz. Bauztg*, 123, *pp.* 80–83, *Feb.* 12, 1944.—The theory of cartography by aerial photography is outlined. The 4 conditions for reproducing stereoscopically an undistorted representation of the ground photographed are given, and auxiliary apparatus fulfilling these conditions is described. The triangulation by overlapping photographs of ground inaccessible to surface survey is described, and the detection and correction of errors of elevation outlined. Mean errors are given for height determinations by 2 methods. The advantages of aerial photogrammetry over the ordinary method are discussed. A. HU.

53.081.5 : 621.317.081.5 2374

Remarks on electrical units. DALZELL, D. P. *Phil. Mag.*, 35, *pp.* 188–191, *March*, 1944.—A critical analysis of Dingle's recent arguments [see Abstr. 76 (1944)] in which the proposed reform of the system of electrical units is deprecated, and a strong preference for the existing conventions expressed. G. F. F.

53.081.5 : 621.317.081.5 2375

On the dimensions of physical magnitudes (fourth paper). DINGLE, H. *Phil. Mag.*, 35, *pp.* 296–300, *May*, 1944.—A reply to criticism by Dalzell [see Abstr. 2374 (1944)] in which the author defends his original position [see Abstr. 76 (1944)] and discounts the criticism. G. F. F.

53.081.5 : 621.317.081.5 2376

Dimensions. WILSON, W. *Phil. Mag.*, 35, *pp.* 420–426, *June*, 1944.—A reply to Dingle [Abstr. 76 (1944)] in the current controversy on fundamental dimensions. G. F. F.

530.12 : 531.51 2377

On the nature of universal gravitation. MILNE, E. A. *Mon. Not. Roy. Astr. Soc.*, 104, 2, *pp.* 120–136, 1944.—The influence on recent gravitation theory of the discovery of the expanding universe is traced. The possibility that a spherical space of positive curvature can exist in Nature is denied, and defects are pointed out in the theory of general relativity. The formal content of expanding-space theories is no more than that of Newtonian mechanics. The basis and structure of the theory of kinematical relativity are outlined, and its development on 4 axiomatic levels is traced. The inverse-square law of gravitational attraction is expressed in Lorentz invariant form by distinguishing betw. 2 methods of measuring time, one appropriate to the Lorentz formulae and electromagnetic phenomena, the other to mechanics and gravitation. The Lorentz formulae are deduced ontologically on the basis of the observers' consciousness of the passage of time, and a change of co-ordinates resulting from a particular regraduation of clocks is shown to convert the kinematical scheme of dynamics and gravitation into a Newtonian one with Einstein's relativistic refinements incorporated. A. HU.

530.145 2378

Difficulties in Dirac's representation theory. I–II. DOBBS, H. A. C. *Phil. Mag.*, 34, *pp.* 651–674, *Oct.*, 1943.—The first point treated is the justification of Dirac's dictum that "any result of a measurement is necessarily a real number." This is found in Eddington's interpretation of the equations of general relativity, viz. that the length of a material standard of measurement bears a const. ratio to the radius of spherical curvature of space-time at the place and in the direction in which it lies. The main discussion centres round the representation of the ψ function representing an arbitrary state of a dynamical system as a sum of the eigen-ψ of an observable. So long as the eigen-ψ form a finite and enumerable set, no difficulty arises. But when Dirac passes over to the case of an observable which has a continuous set of eigen-values, a contradiction arises. For his method leads to the conclusion that an enumerably infinite series is identifiable with a series equal to the number of points in a line and this is known to be fallacious. The crucial point here is Dirac's "assimilation postulate" which states that it is possible to regard a continuous range of numbers as a limiting form of a discrete set whose density is increased indefinitely. [See Abstr. 2379 (1944)]. G. C. McV.

530.145 2379

Difficulties in Dirac's representation theory. III. DOBBS, H. A. C. *Phil. Mag.*, 34, *pp.* 723–744, *Nov.*, 1943.—Mathematically the "assimilation postulate" finds its leading expression in the δ-function, $\int_{-\infty}^{\infty}\delta(x)dx = 1$, $\delta(x) = 0$, $(x \neq 0)$. It is shown that the integration here involved cannot be Riemannian, as Dirac assumes. A second important concept associated with the assimilation postulate is the "weight function" which represents the density of the discrete points in a small but discrete interval in the domain of a variable. Here again integrations involving this function cannot be Riemannian nor can they even be of the more general type introduced by Lebesgue. The distinction between Dirac's procedure and the (justifiable) procedure in statistics of employing a continuous distribution to test the goodness of fit of a hypothesis relating to a discontinuous frequency distribution, is exhaustively analysed and shown to have no bearing on Dirac's methods. As remedies for these difficulties, the author suggests (1) that non-Riemannian integration must be used in the representation theory; (2) that it must be admitted that dynamical systems may have a non-denumerable set of degrees of freedom; and (3) that there is a particle-wave and a discrete-continuous, dichotomy underlying theories of matter. This dichotomy leads to the notion that observed data, being discontinuous, lead to a discrete representation which, through interpolations, in turn produces a continuous representation. The latter, through an inverse interpolation, brings us back to a discrete representation for the inferences susceptible of experimental verification. G. C. McV.

530.145.6 : 621.385.833 : 537.533.72 = 3
see Abstr. 2449

530.145.63 2380

Dirac's wave equation in five-dimensional relativity theory. JONSSON, C. V. *Ark. Mat. Astr. Fys.*, 28*B*, 4, *No.* 17, 7 *pp.*, 1942.—The term for the electron

mass m in the wave equation for electric particles in 5-dimensional relativity theory appears as the difference betw. 2 much larger terms, each about $10^{20}\,m$. By abandoning the homogeneous formulation of Dirac's equation for a non-homogeneous treatment, this difficulty is avoided. A. HU.

531.221.8 2381

Exercises on a tightrope. NEVILLE, E. H. *Phil. Mag.*, 35, *pp.* 414–419, *June*, 1944.—The problem is that of shallow catenary arcs formed by a continuous rope which passes over pegs or through rings. A process is developed for dealing with the general problem to any required degree of accuracy. One of the results states: If a uniform, almost tight rope hangs in festoons through any number of smooth rings, then to a first approx. the ratio of the length of slack in any festoon to the chord of the festoon is proportional to the square of the horizontal span of the festoon. G. E. A.

531.225 : 512.972 2382

Remark on a distortion tensor for elastic displacements. THOMAS, T. Y. *Proc. Nat. Acad. Sci., Wash.*, 30, *pp.* 140–143, *June*, 1944.—The distortion tensor D, defined in terms of the strain tensor e of elasticity theory, is such that yield resulting from a state of stress will occur when D^2 attains a value characteristic of the material. This provides an alternative to the von Mises condition that yield will occur when the energy per unit volume produced by a change of shape alone reaches a certain characteristic value. L. S. G.

531.258 2383

General solution of two-dimensional problems of elasticity. BESKIN, L. *J. Appl. Phys.*, 15, *pp.* 562–567, *July*, 1944.—A simply connected domain is considered with an arbitrary boundary and given volume and boundary forces. The solution is determined by superposition of 2 solutions: (i) that of the equilibrium of an infinite domain with given volume forces, (ii) that of the equilibrium of a bounded domain with given boundary forces and zero volume forces. The solution of (i) is known, and to solve (ii), a procedure is given involving some integrations and the solution of some integral equations. L. S. G.

531.51 : 530.12 *see Abstr.* 2377

531.566 : 623.5 2384

An optical sighting gauge for the Garand rifle. SITTERSON, C. B., JR., AND BARNES, N. F. *J. Opt. Soc. Amer.*, 34, *pp.* 126–129, *March*, 1944.—Sighting new rifles for zero windage and 100 yd. elevation is carried out by an optical method, using only the last 4 in. of the bore. Once the gauge has been calibrated with a std. rifle sighted on a range, sighting can proceed at the rate of 40 rifles per hr., as compared with 8 per hr. by the direct method. A. HU.

531.718 : 621.926 : 621.317.39 2385

Automatic measuring on grinding machines. *Industr. Diamond Rev.*, 4, *pp.* 143–148, *July*, 1944.—[Abstr. 1854 B (1944)].

531.77 : 534.154 : 621.317.39 2386

An electronic tachometer, accelerometer and vibrometer. *Electronics*, 17, *pp.* 100–104, 310 *and* 312, *June*, 1944.—[Abstr. 1958 B (1944)].

531.787 : 621.317.39 = 3 2387

A measuring instrument for high and low gas pressures using semi-conducting resistors. WEISE, E. *Z. techn. Phys.*, 24, 4, *pp.* 66–69, 1943.—[Abstr. 1855 B (1944)].

531.791 : 621.317.39 2388

A four-tube counter decade. POTTER, J. T. *Electronics*, 17, *pp.* 110–113, 358 *and* 360, *June*, 1944.—[Abstr. 1856 B (1944)].

532.517.2 2389

Model tests of flow into drains. HARDING, S. W., AND WOOD, J. K. *Soil Sci. Soc. Amer. Proc.*, 6, *pp.* 117–119, 1941.—Photography of stream lines of water flowing into drains arranged in a model tank containing soil lying over artesian gravel indicate that each case examined satisfies Laplace's equation [see Abstr. 2392 (1944)]. J. S. G. T.

532.517.2 2390

Laminar flow at the interface of two liquids. KEULEGAN, G. H. *J. Res. Nat. Bur. Stand., Wash.*, 32, *pp.* 303–328, *June*, 1944.—The velocity distribution in the laminar boundary layers at the interface of two liquids in relative rectilinear motion, the thickness of the layers and the stress at the interface, are determined. Numerical results are given for 9 cases of liquids in contact, incl. identical liquids and liquids with varying deg. of dissimilarity in characteristics. The evaluation of the desired quantities is based on Prandtl's boundary-layer theory, and is carried out by a method of successive approximations. The numerical results are those given by the second approx.

532.528 2391

The destructive action of cavitation. KORNFELD, M., AND SUVOROV, L. *J. Appl. Phys.*, 15, *pp.* 495–506, *June*, 1944.—Theories of cavitation and the destructive action associated therewith are briefly reviewed. Employing a Gaines oscillator [Abstr. 678 (1933)] and utilizing the magnetostriction effect to excite longitudinal vibration in a nickel tube, the author has studied visually and photographically, the destructive action of bubbles produced by the vibrations, upon surfaces immersed in water. Forces of attraction and repulsion between bubbles, changes of shape of bubbles, "dancing" bubbles, and forced vibrations excited in the bubbles, are discussed. The destructive action of cavities is attributable to the direct blow of water against the surface exposed to cavitation, and can hardly be attributable to hydrodynamic pressures. The main part in the destruction of ships' propellers by cavitation is played by unstable surface cavities. J. S. G. T.

532.582.7 2392

Modification of a theory on the relation of suspended to bed-material in rivers. KIRKHAM, D. *Trans. Amer. Geophys. Un.*, *pp.* 618–621, 1942.—Lane and Kalmske have derived a functional equation relating the amount of suspended material carried by a stream to the physical characteristics of the bed and channel [*Trans. Amer. Geophys. Un.*, 1939, p. 627]. The author proposes that the equation be modified by introduction of a function containing the probability integral taken between limits and involving a quantity which is the ratio of the vertical to the longitudinal velocity fluctuations at the stream bottom. Theo-

retical results and field data are in satisfactory agreement. J. S. G. T.

532.613.4 2393

On Harkins' "final spreading coefficient" and Antonoff's "rule." Fox, W. *J. Phys. Chem.*, 48, *pp.* 158–159, *May*, 1944.—[See Abstr. 2527 (1943)].

532.69 : 539.61 : 541.183 2394

Experiments regarding the influence of an adsorbed layer on cohesion and coalescence in liquids and in solids. Benedicks, C., and Sederholm, P. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 6, 34 *pp.*, 1944.—Various experiments are described relating to the phenomenon of the floating drop, the stability of which is characterized by its time of existence (durability). This was found to be about 10 sec. in the case of alcohol. The phenomenon is largely due to absorption of moisture in the surface layers. It is shown by H_2SO_4 when this has an appreciable water content. In a solution of saponin (which shows strong adsorption) the durability, and hence the adsorption, possesses a max. at a conc. of about 1%. In malt beverages (possessing strong foaming and hence adsorption) the phenomenon is very prominent (durability of 20 to 25 sec.). The presence of CO_2 in the liquid is necessary. Artificial adsorption layers were produced by thin oil films on water and the durability is very great in this case. Fluid foams (containing only liquid matter) are studied, one of these being made from saponin-solution and oil. The phenomenon of the floating drop was also found to occur in molten paraffin, and there is a marked adsorption in solid paraffin. The cohesion between 2 plane surfaces was determined and this is high for freshly cut surfaces (adsorption excluded) but very low for cut surfaces after exposure to air. Similar experiments to those carried out on solid paraffin were made on solid metals, lead and tin. It is found that the influence of a foreign adsorbed layer strongly reduces the cohesion.

L. S. G.

532.69 : 541.182.4 2395

Development and use of certain flotation reagents. Dean, R. S., and Ambrose, P. M. *Bull. U.S. Bur. Min.*, *No.* 449, 89 *pp.*, 1944.—The historic development of flotation reagents and of Perkins' experiments with chemical compounds whose structure was a combination of polar and non-polar groups is sketched. The development of usable flotation theory, incl. gas-envelope theory, water-repellent coatings, adsorption, slime coatings, detergent theory, cyanide depression, flotation tests with various reagents, over-detergency and over-flocculation, is reviewed. The chemical structures of flotation reagents and the newer wetting agents of great detergent power are discussed. Wetting agents made by sulphation of hydroxylated organic compounds and by condensation products of alkylolamines and fatty acids are described. The effect of addition agents on flotation with anionic and cationic wetting reagents is discussed in great detail, pyridinium salts receiving special consideration together with quaternary ammonium compounds, amine, and positive-ion reagents obtained from alkylolamines; emulsions as flotation reagents are dealt with. The bulletin contains 34 illustrations and a most comprehensive index. H. H. Ho.

532.69 : 541.182.6 *see Abstr.* 2477, 2478

532.694.1 2396

Foam formation in organic liquids. King, E. G. *J. Phys. Chem.*, 48, *pp.* 141–153, *May*, 1944.—Foams comparable in volume and stability to aq. foams can be produced in organic liquids. Liquids with surface tensions > those of the common volatile solvents are more susceptible to foam propagation. There are indications that certain solvents have a greater tendency to support foam formation than others of comparable surface tension. Foaming is usually accompanied by a decrease in surface tension, but the converse is not necessarily true. In some instances stable voluminous foams were obtained with surface-tension decreases of 5·6 to 37·2 dynes, while in other cases changes of the same range of magnitude gave no foam formation. The least voluminous of these foams occurred where the surface-tension change was small but there is not sufficient evidence that effective foams could not be produced in conjunction with even smaller changes. Physical properties (v.p. and viscosity) do not seem to be factors in foam initiation, but they influence the stability. Several types of colloidal electrolytes are surface-active in organic liquids.

533.6.07 2397

Some considerations influencing the design of wind tunnels. Darrieus, G. *Brown Boveri Rev.*, 30, *pp.* 168–176, *July–Aug.*, 1943.—Includes notes on the choice between open and re-circulating tunnels, design of filters, selection of jet proportions and other design points. W. W. C.

533.6.07 2398

Supersonic wind tunnels. Seippel, C. *Brown Boveri Rev.*, 30, *pp.* 176–183, *July–Aug.*, 1943.—A discussion of difference between subsonic and ultrasonic flow is followed by an account of some features of the design of continuously operated ultrasonic tunnels. There is a cross-section of the one at the Swiss Institute of Technology. W. W. C.

534.015 : 621.396.611.3 2399

A new approach to the dynamics of systems with gyroscopic coupling terms. Bloch, A. *Phil. Mag.*, 35, *pp.* 315-334, *May*, 1944.—An essential for the use of electrical analogies is the presence in the mechanical systems of symmetrical mutual impedances. In systems with gyroscopic couplings, the symmetry gives place in part to a skew symmetry. An ideal gyroscopic coupler is introduced, to be afterwards omitted, and the resulting system is then treated by means of either of the electrical analogies. The method is applied to systems containing one or more gyrostatic couplers. The structure and behaviour of systems to which the method is applicable are discussed. When the method is inapplicable, a class of mechanical systems is found which have asymmetrical impedance properties corresponding to electrical systems containing valves. An example of such a system is given. G. E. A.

534.154 : 621.317.39 : 531.77 *see Abstr.* 2386

534.22.094 2400

On the dispersion of high-frequency acoustic waves in liquids. Ginsburg, V. L. *C.R. Acad. Sci. URSS*, 36, 1, *pp.* 8–13, 1942.—A survey of available experimental data shows that sound velocity in CCl_4, glycer-

ine and castor oil increases with increase in frequency, as would be expected from considerations of viscosity and relaxation phenomena. In acetone the velocity decreases with increase in frequency. Various theoretical arguments are advanced to account for this "negative" dispersion, a general equation for the sound velocity being derived. A. E. T.

534.372.08 : 620.178.311.6 : 539.4.019 *see Abstr.* 2466

534.414 2401

Compensating acoustic resonator appliances. KARNOVSKY, M. I. *C.R. Acad. Sci. URSS*, 37, 1, *pp.* 24–27, 1942.—The conclusion of Helmholtz and Rayleigh, that the radiation of a source can be increased by a resonator is examined theoretically in relation to the range of frequencies. This leads to the result that this reinforcing action is confined to a definite region of frequencies. Experimental verification has been obtained from measurements on a moving-coil baffle loud-speaker, as source, in relation to a series of glass flasks as resonators. Acoustic spectrograms are recorded. A. E. T.

534.837 2402

The reduction of noise from air-conditioning systems. KING, A. J. *Engineering*, 157, *pp.* 501-504, *June* 30, 1944.—The causes of noise which are considered in detail are: direct radiation from motor and fan, secondary radiation due to vibration conduction, noise from fan carried along the air stream, and noise from turbulence in the air stream. Measures for reducing these noises are outlined; in most cases a compromise has to be chosen between cheapness and quietness. G. E. A.

534.862.1 2403

Evolution of scoring facilities at Columbia Pictures. LIVADARY, J. P., AND RETTINGER, M. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 361–366, *June*, 1944.—The scoring facilities in 1935 were modified to allow the recording of larger bands. A production stage was converted into a scoring stage, and a vocalist's room was constructed to allow the separate and simultaneous recording of songs and orchestrations and the two combined. Electric circuits were devised for mixing 3 tracks. G. E. A.

534.862.1 2404

Improvements in Disney scoring stage. SLYFIELD, C. O. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 367–371, *June*, 1944.—Details of the construction of 2 shells, one temporary and one permanent, and modifications made to obtain the best acoustic balance for orchestra recording, including the reduction of excessive l.f. reverberation. G. E. A.

534.862.1 2405

Acoustic considerations in the construction of vocal studios. MOUNCE, E. B., PORTMAN, C., AND RETTINGER, M. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 372–374, *June*, 1944.—When recording vocal numbers in a small room, it is recommended that, to avoid coincident reinforcement of the normal modes of resonant vibration, the ratio of height, width and length of the room should vary with the $^2/_3$ power of 2, e.g. $1 : \sqrt[3]{4} : \sqrt[3]{16}$. Non-parallel walls prevent echoes. G. E. A.

534.862.1 2406

The vocal room and pre-scoring operations at RKO Radio Pictures. MOUNCE, E. B., PORTMAN, C., AND RETTINGER, M. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 375–378, *June*, 1944.—To improve the acoustic isolation of vocalists, a room was installed on the scoring stage, large enough to accommodate a chorus of 30. Voice and orchestra are recorded on separate tracks, and monitoring is done by bridging the monitor speaker across both channels. G. E. A.

534.862.1 2407

New scoring stage shell and vocal studio design. RYDER, L. L. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 379–383, *June*, 1944.—After consultation with musicians and acoustical experts, a shell was purchased and modified to satisfy the members of the orchestra and the conductor and to obtain dual-channel recording of chorus and orchestra. On occasion a reflector is used to build up the effect of the violin section. G. E. A.

534.862.3 2408

A visual light-valve checking device. CORCORAN, J. P. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 283–286, *May*, 1944.—Details are given of the equipment and method by means of which the light-valve image may be magnified and projected on to a screen, thus permitting the inspection of the valve's operation under both a static condition and the application of steady tone. A. H.

534.862.3 : 621.395.625.3 2409

Investigation of magnetic tape recorders. SELBY, M. C. *Electronics*, 17, *pp.* 133–135 *and* 302, *May*, 1944.—[Abstr. 1898 B (1944)].

535.24 : 628.9 2410

The effectiveness of lighting: its numerical assessment by methods based on blinking rates. *Trans. Illum. Engng Soc., Lond.*, 9, *pp.* 126–128, *July*, 1944.—Discussion. [See Abstr. 1914 (1943)].

535.241.33 : 621.327.31 2411

The mercury arc as a standard of ultra-violet radiation. COOLIDGE, A. S. *J. Opt. Soc. Amer.*, 34, *pp.* 291–301, *June*, 1944.—[Abstr. 1870 B (1944)].

535.247.4 2412

General-purpose photo-electric photometer and its use in textile laboratories. CHAMBERLAIN, N. H. *J. Text. Inst., Manchr*, 35, *T*61–*T*76, *June*, 1944.—Describes a photometer for routine use in textile laboratories for various purposes. It consists of a $Cs\text{-}Ag_2O$ gas-filled cell with 3-stage amplification, the light falling on the cell being interrupted to give about 1 300 c./s. The response is found to be strictly $\propto$ the incident light. Separate descriptions are given of its use (*a*) as a nephelometer or an absorption colorimeter, (*b*) for measuring fibre diams., (*c*) for measuring the optical densities in X-ray photographs, and (*d*) as a glossmeter or a reflection colorimeter. J. W. T. W.

535.317 : 535.8 2413

New catadioptric meniscus systems. MAKSUTOV, D. D. *J. Opt. Soc. Amer.*, 34, *pp.* 270–284, *May*, 1944.—Reviews a number of problems in which meniscus catadioptric systems can be of use. It is claimed that these systems are practically free from chromatism, spherical aberration, coma and—in many cases—astigmatism. The defects of reflectors and refractors are discussed, then consideration is given to the following systems—meniscus, meniscus-concave mirror, Newtonian, Herschellian, Gregorian, Casse-

grainian, Schmidt. Applications to amateur work are also dealt with. A. H.

535.321.5 2414

A precision apparatus for the rapid determination of indices of refraction and dispersion by immersion. FAICK, C. A., AND FONOROFF, B. *J. Opt. Soc. Amer.*, 34, *pp.* 330-336, *June*, 1944. [See Abstr. 1573 (1944)].

535.33.03 : 669.3 : 621.325.5 2415

Further correspondence on M. Milbourn's paper: "The spectrographic analysis of copper and copper-rich alloys by the arc method." *J. Inst. Met.*, 70, *pp.* 297–300, *June*, 1944.—[See Abstr. 550 B (1944)].

535.33.072 2416

Optical spectra within the ordinary X-ray region recorded with curved crystal. FLEMBERG, H. *Ark. Mat. Astr. Fys.*, 28*A*, 4, *No.* 18, 47 *pp.*, 1942.—Curved crystals are shown to be more suitable than concave gratings for recording spectra at wavelengths < 15 Å. Inherent errors and precautions necessary in their use are discussed. A detailed description is given of a vacuum spectrograph which uses curved mica or gypsum crystals for photographing spectra produced by a vacuum spark. Comparison X-ray spectra are used to give reference lines for the calculation of wavelengths. Results for the principal series of F VIII, Mg XI and Al XII are given and are used to calculate the ground state $1s^2\ {}^1S_0$ for these ions. The lines measured lie betw. 17 and 6·3 Å, thus extending by an octave the region of optical spectra. A. HU.

535.33.072 : 522.56 2417

The McGregor spectrograph of the McMath-Hulbert Observatory. MOHLER, O. *J. Opt. Soc. Amer.*, 34, *pp.* 121–125, *March*, 1944.—The author describes a modified spectroheliograph, designed for intensity measurements, which uses a plane grating and lens in Littrow fashion. An image of the Sun is formed on the first slit, which is a rectangle 1 mm. × 0·1 mm. The second slit, similar in size, is moved back and forth along parallel adjoining paths until the whole area of 19 × 26 mm. is scanned. A lens behind the second slit images the grating on to a photocell, the output of which is recorded on tape and is a measure of the light intensity at a selected point of the solar image in a pre-determined wavelength band. A. HU.

535.336.2 = 3 2418

A new mass spectrograph. REUTERSWÄRD, C. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 7, 4 *pp.*, 1944.—A new instrument is described, similar to the double-focusing mass spectrograph [Abstr. 4943 (1936)]. Experimental results are briefly reported relating to the triplet CH_4-NH_2-O. L. S. G.

535.338 : 546.11 2419

Experimental verification of the theory of the continuous spectra of H_2 and D_2. COOLIDGE, A. S. *Phys. Rev.*, 65, *pp.* 236-246, *April* 1 *and* 15, 1944.—Continuous spectra of molecular hydrogen and deuterium are studied with control of the excitation processes involved, the electron beam being subjected to definite accelerating potentials. Comparison of the results with theory was not possible, because of thermal spread in the electron kinetic energies, until the necessary modifications to theory were performed. With establishment of the true potential scale good agreement is observed between calculated and observed spectral energy distribution. A. H.

535.339 : 548.73 *see Abstr.* 2488

535.343 : 541.651 2420

An application of the method of continuous variations to complex-ion formation in copper (II) salt solutions containing chloride ion. MOELLER, T. *J. Phys. Chem.*, 48, *pp.* 111-119, *May*, 1944.—Alterations in the absorption spectra of Cu(II) salt solutions produced by addition of chloride ion are ascribed to the formation of Cl containing complex ions. Application of the method of continuous variations clearly indicates the presence of the $CuCl_4^{--}$ ion but gives no information rel. to the presence or absence of other complexes. Equilibria between $Cu(H_2O)_4^{++}$ and the relatively unstable $CuCl_4^{--}$ ions account for variations in colour in such systems. Colour changes produced by concentration of copper (II) chloride solutions are due to the appearance of $CuCl_4^{--}$ ions as a result of an autocomplexing process.

535.343.3 2421

Polymer spectra of a cyanine dye. MATTOON, R. W. *J. Chem. Phys.*, 12, *pp.* 268–276, *June*, 1944.—In dilute aq. solutions the dye 1,1′-diethyl-2,2′-cyanine chloride has 2 broad mol. absorption bands at 4 900 and 5 230 Å. For a 10^{-2} molar water solution at room temp. (a gel), an intense and narrow absorption and fluorescence band is observed at 5 730 Å. The occurrence and behaviour of this "P band" are studied for thin dye films on glass. Removal of water or increase in temperature moves the band to the red and causes it to disappear, the behaviour being reversible. A second, weaker band appears at 5 430 Å for higher dye concentrations. It is suggested that the P band is due to single dye polymer chains, the second band to a system of coupled chains. An attempt was made to determine the number of water molecules per dye molecule necessary for polymerization. A. H.

535.343.4 : 523.872 *see Abstr.* 2371

535.371.07 : 621.385.832 = 3 2422

Experimental investigations on the resolving power of luminiscent screens. HINDERER, H. *Z. Phys.*, 119, 7–8, *pp.* 397–405, 1942.—Multi- and single-crystal screens are investigated with ultra-violet excitation by the double-wedge, and with excitation by cathode rays by the sharp-edge method. Bright and dark double wedges yield the same results. The major influences affecting the resolving power are roughness of the screen surface and scattering in the luminescent material of the exciting and emitted radiation. H. G. S.

535.372 2423

Light yield of photoluminescence of aqueous solutions of Tl^+ salts. KONDILENKO, I. I., AND SHISHLOVSKY, A. A. *C.R. Acad. Sci. URSS*, 35, 8, *pp.* 236–240, 1942.—Describes spectral investigations, incl. the ultra-violet part of the emission spectrum, and measurements of the abs. value of the light yield for the emission spectrum as a whole. Solutions studied were a pure aq. solution of TlCl and a mixed aq. alkaline haloid solution of TlCl + KCl. The measurements of the abs. energy yield were based on

comparative measurements of the energy yield for the solution investigated and that for fluoresceine solution, for which the yield is known. The quantum yield was calculated from the abs. energy yield. The results obtained are set out in a table which shows how the light yield (energy and quantum) is influenced by the conc. of free Cl-ions in solution. A. E. T.

535.375.5 : 536.631 : 548.0 *see Abstr.* 2481

535.434 2424

Experiments in scattered light. Angles of first minimum. TAMHANKAR, R. V., AND PARANJPE, G. R. *Indian J. Phys.*, 17, *pp.* 287–294, *Oct.*, 1943.—The distribution of intensity of light scattered in the region of the transmitted direction was studied theoretically for 4 drop-sizes of water vapour, $a = 15$, 20, 25 and 30, where a = the ratio of the circumference of the drop to the wavelength of the light used. The range was 150°–180°. A sharp min. of intensity may be correlated with the first-order corona ring for the drop-sizes considered. The theoretical results are verified experimentally. The scattered intensity was measured by a photocell coupled with an amplification arrangement.

535.434 2425

Light-scattering in solutions. DEBYE, P. *J. Appl. Phys.*, 15, *pp.* 338–342, *April*, 1944.—A survey article dealing with some of the conclusions which can be drawn from results of measurements on the scattering of light in solutions of polymers. Consideration is given mainly to (1) particles small compared with λ, and (2) particles comparable with or $> \lambda$. A. H.

535.543 2426

Scalar polarization fringes produced by the superposition of crystalline plates. BILLINGS, B. H. *J. Opt. Soc. Amer.*, 34, *pp.* 267–284, *May*, 1944.—Discusses briefly the theory attaching to the appearance of the simpler scalar fringes obtained by superposing different sets of polarization fringes in crystalline plates. A. H.

535.7 : 523.45 *see Abstr.* 2341

535.733.1 2427

On the Stiles–Crawford effect. MOON, P., AND SPENCER, D. E. *J. Opt. Soc. Amer.*, 34, *pp.* 319–329, *June*, 1944.—Light entering the eye near the edge of the pupil is much less effective than that entering centrally, so the illumination of the retinal image is not proportional to the pupillary area. The authors propose a std. curve relating pupil dia. with brightness of adapting field and a std. expression representing the relative effectiveness of light entering the eye at different distances from the centre. This latter expression can be used to compute the relative retinal illuminations for pupils of different diameters. The ratio to the value found for a dia. of 2 mm. is termed the "Stiles factor." The application to practical illumination work is described. J. W. T. W.

535.733.1 2428

Colour of small objects. WILLMER, E. N. *Nature, Lond.*, 153, *pp.* 774–775, *June* 24, 1944.—Describes a simple experiment in colour vision at the fovea and parafovea supporting the theory, previously proposed, that colour vision could be explained in terms of 2 receptors, the cones and the rods. The author considers that the results now demonstrated may be explained on the assumption that the centre of the fovea consists not only of cones but also of rods, the latter depending on visual purple but not accumulating it. J. W. T. W.

535.733.1 2429

Visibility of blue and yellow. HARTRIDGE, H. *Nature, Lond.*, 153, *pp.* 775–776, *June* 24, 1944.—A pattern of blue and yellow areas, when viewed at a sufficient distance, appears, in certain circumstances, as black and white. The effects of (*a*) angular size of pattern, (*b*) pupil dia., and (*c*) illumination have been investigated and the results are described. The explanation of the phenomena observed is given in terms of the dilution of the pigments with white light and of the loss of intensity of blue as the visual angle is decreased. J. W. T. W.

535.8 : 535.317 *see Abstr.* 2413

535.821 2430

Meridional magnifying lens systems in the measurement and correction of aniseikonia. OGLE, K. N. *J. Opt. Soc. Amer.*, 34, *pp.* 302–312, *June*, 1944.—Some of the theoretical aspects of meridional magnifying systems and combinations of such systems are discussed, especially as applicable to the measurement and correction of aniseikonic errors, difference between the size of the ocular images in the two eyes which lead to anomalous binocular (stereoscopic) space perception. A. H.

535.88 : 621.326.73 2431

Improvement in illumination efficiency of motion-picture printers. KUNZ, C. J., GOLDBERG, H. E., AND IVES, C. E. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 294–314, *May*, 1944.—[Abstr. 1965 B (1944)].

536.212.3 : 539.3 : 677 2432

A study of the properties of household blankets. SCHIEFER, H. F., STEVENS, H. T., MACK, P. B., AND BOYLAND, P. M. *J. Res. Nat. Bur. Stand., Wash.*, 32, *pp.* 261–284, *June*, 1944.—The fibre composition, weight, thickness, compressibility, compressional resilience, thermal transmission, air permeability, breaking strength, and shrinkage of 156 different blankets are recorded. The effects of laundering and renapping; of laundering, renapping and abrasion; of dry cleaning and renapping; and of dry cleaning, renapping and abrasion, on these properties of a large number of blankets are shown. A linear relationship was found between the compressional resilience and the wool content of cotton-wool blankets. The thermal transmission of the blankets was independent of the kind of fibre. The reciprocal of thermal transmission was related linearly to the thickness. Empirical relationships were also found among thermal transmission, thickness at 1·0 lb./in.^{2}, and compressibility; and among thickness at 0·10 lb./in.^{2}, compressibility and weight. The relation between breaking strength and weight, and that between breaking strength and compressibility, are discussed.

536.24 2433

Heat-transfer data. LYPE, E. F. *Mech. Engng, N.Y.*, 66, *pp.* 254–256, *April*, 1944.—This correlation of Huge's and Pierson's results [Abstr. 3017 B, 3018 B (1937)] for gases flowing transversely over banks of pipes suggests that for pipes in line, $Nu = 174(R_e/40\,000)^n$ and that for staggered pipes

$Nu = Nu_0(R_e/40\,000)^{4/7}$. Graphs are reproduced which facilitate the evaluation of the heat transfer coefficient for each type of arrangement and for various pipe diameters and spacings. Examples illustrate their use. R. W. P.

536.33 = 3 2434

Heat radiation. Summary of important practical laws. SAUTER, O. *Bull. Ass. Suisse Élect.*, 34, *pp.* 107–111, *March* 10, 1943.—Summarizes the laws governing the radiation of heat from a black body, from technical surfaces including non-electrical conductors and polished metals, and for reflection of radiation from surfaces. Emissivity values applicable to 200°C. are tabulated for several materials. R. W. P.

536.33 = 3 2435

A new method of calculating the heat exchange by radiation. ORDINANZ, W. *Schweiz. Arch. angew. Wiss. Techn.*, 10, *pp.* 113–115, *April*, 1944.—A brief account of the subject, after which attention is drawn to a systematic and new method for dealing with radiation problems which has been developed by G. L. Pollak (*Diss. Moscow Energy Institute*, 1938). Some "theorems" enunciated in this work are given. R. W. P.

536.52 2436

Radiation pyrometry in turbo-supercharger testing. HEAD, V. P. *Trans. Amer. Soc. Mech. Engrs*, 66, *pp.* 265–269, *May*, 1944.—The development of a pyrometer of the glass-bulb vacuum thermocouple type for use in the measurement of turbine-wheel and bucket temperatures is described. The research has resulted in the min. temperature for practical application being lowered from 1 500°F. to about 300°F., and further lowering is possible. The target area can be $< {}^1/_4$ in. dia. It is suggested that the method may serve as a secondary std. in the calibration of base-metal thermocouples and of thermometers for temperatures $> 1\,000$°F., and that the rigorous application of thermo-electric radiation pyrometry theory may permit sharper definition in the International Centigrade Temperature scale at elevated temperatures. Another application is for the measurement of pressure at high vacuum. R. W. P.

536.631 : 535.375.5 : 548.0 *see Abstr.* 2481

536.715-35 2437

Polytropic changes in an enclosure containing matter and radiation. REIZ, A. *Ark. Mat. Astr. Fys.*, 28*B*, 4, *No.* 11, 4 *pp.*, 1942.—The classical expression for the adiabatic exponent, and two others by Chandrasekhar, are shown to be valid for a polytropic change of state if for γ, the ratio c_p/c_v of the sp. hts., the polytropic exponent $\gamma' = (c_p - c)/(c_v - c)$ is substituted, c being the polytropic specific heat. A. HU.

536.73 : 621.1.016 2438

Second law of thermodynamics for changes of state and quantity of working substance with particular reference to steam engines. ZERKOWITZ, G. *J. Appl. Mech.*, 11, *A*108–*A*112, *June*, 1944.—Fundamental equations are given regarding the changes of state of a working substance, which are based on a general formulation of the second law of thermodynamics. From simple cases, such as the adiabatic emptying and filling of a receptacle, the treatment is extended to include problems applicable to piston engines. It is shown to be necessary to examine each case to determine how the entropy diagram can be applied, since it can only be unrestrictedly used for pure changes of state, in which the quantity of the working substance remains const. R. W. P.

536.77 : 541.124.7 *see Abstr.* 2471

537.11 : 538.63 2439

On the nature of elementary electric charges. MITKEWICH, W. F. *C.R. Acad. Sci. URSS*, 37, 3, *pp.* 94–97, 1942.—Various hypotheses lead to the inference that electric charges should arise from the transformation of magnetic flux elements, i.e. that there is a magnetic equivalent to static electricity. The author has carried out experiments to test this possibility. Magnetic flux elements were set up by a toroidal winding fed by an h.f. spark generator and surrounded by an open iron screen. A quadrant electrometer was used to detect the electric charges which might arise in the central chamber of the iron screen, as a result of the suggested transformations. Deflections of the electrometer were actually observed, but were of such nature that no final conclusions could yet be reached. A. E. T.

537.312.62 2440

Variation of supraconductivity of tin under non-uniform tension. LASAREFF, B. G., AND GALKIN, A. A. *C.R. Acad. Sci. URSS*, 37, 3, *pp.* 91–92, 1942.—It has been observed that with thin Sn films freshly prepared by condensation on glass cooled with liquid He, abnormally high values are obtained for the critical temperatures (T_k) of supraconductivity and magnetic field (H_k), whilst the critical currents (I_k) are abnormally low. The note describes preliminary investigations on the supraconductivity of Sn, which show that abnormally high values of T_k, H_k and dH_k/dT, and low values of I_k, may also be observed in thick metal (wires), when certain conditions of tensile strain are provided. In both cases the anomalies are attributed to the existence of strong local tensile strains in the crystal lattice. A. E. T.

537.312.8 2441

On the conductivity of a metal in a magnetic field. WALLER, I. *Ark. Mat. Astr. Fys.*, 28*B*, 4, *No.* 15, 7 *pp*, 1942.—It is proved that for temperatures higher than the characteristic temperature, where the electron collisions with the lattice are approx. elastic, the ratio betw. the tensors of electrical and thermal conductivity of a metal in a magnetic field is const. New formulae are derived for the change of resistance in a magnetic field. A. HU.

537.523.5 : 621.325 = 3 2442

The spectral distribution of the energy of the radiation of high-current carbon arcs (Investigations on high-current carbon arcs. VI). FINKELNBURG, W., AND SCHLUGE, H. *Z. Phys.*, 119, 7–8, *pp.* 527–528, 1942.—Errata [Abstr. 915 (1944)]. H. G. S.

537.525.8 2443

Influence of temperature on the quenching of active nitrogen at various pressures. JOSHI, S. S., AND PURUSHOTHAM, A. *Proc. Indian Acad. Sci. A*, 19, *pp.* 159–162, *April*, 1944.—Quenching of the afterglow of active N is dependent on temperature and occurs

t a definite temp., which is higher the higher the treaming pressure of the gas. Values at 15 and 3 mm. Hg are 215° and 330°. Existence of a hemically active form of N, which exhibits no after-low, is considered improbable. [See Abstr. 916 1944)]. W. R. A.

537.525.8 2444

Activation of nitrogen at liquid-air temperature. OSHI, S. S., AND PURUSHOTHAM, A. *Curr. Sci.*, 13, 155, *June*, 1944.—[See Abstr. 2443 (1944)].

537.525.92 : 621.396.615.1 = 3 2445

On plasma transit-time oscillations. SCHUMANN, W. O. *Z. Phys.*, 121, 1–2, *pp.* 7–33, 1943.—[Abstr. 901 B (1944)].

537.531.9 : 575.322 2446

The effect of X-rays upon dominant mutation in naize. STADLER, L. J. *Proc. Nat. Acad. Sci., Wash.*, 30, *pp.* 123–128, *June*, 1944.—X-ray treatment was applied to the ears 73–81 hr. after pollination. Treatments were made on field-grown plants by a mobile X-ray unit with self-rectifying tube, operated at 88 kV, 4·5 mA tube current, and 15 in. target distance, with no filtration other than that of the overlying tissue. The doses applied, uncorrected for filtration, were 800 r and 1 600 r. X-ray treatment failed to induce mutation of *a* to *A* (or to any other coloured aleurone allele), in populations which, with the X-ray doses applied, were capable of yielding 900 000 losses of *A* by deficiency or by mutation to a colourless allele. The *a* genes used in the experiment, when combined with *Dt*, yielded numerous mutations to *A* or other coloured aleurone alleles. The population irradiated was large enough to have yielded, under the influence of homozygous *Dt*, about 400 000 of such mutations.

537.531.9 : 581.48.03 2447

The biological effects of X-rays as a function of intensity. BLESS, A. A. *Proc. Nat. Acad. Sci., Wash.*, 30, *pp.* 118–121, *May*, 1944.—The seeds (wheat) were soaked in water for 3 hr., and then spread in trays over moist filter paper. After 12 hr. the seeds were placed on plates and exposed to X-rays. After 48 hr. of sprouting, the length of the stems was measured; this was used as the biological indicator. Graphs of results show that different intensities do not produce any marked differences.

537.533.1 : 621.385.833 = 3 2448

On the resolving power of the emission microscope. DOSSE, J., AND MÜLLER, H. O. *Z. Phys.*, 119, 7–8, *pp.* 415–422, 1942.—[Abstr. 1891 B (1944)].

537.533.72 : 530.145.6 : 621.385.833 = 3 2449

Image formation and the resolving power of the electron microscope from the standpoint of wave mechanics. GLASER, W. *Z. Phys.*, 121, 11–12, *pp.* 647–666, 1943.—[Abstr. 1892 B (1944)].

537.533.72 : 621.385.833 2450

Formation of image in a strong magnetic lens. SIEGBAHN, K. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 1, 12 *pp.*, 1944.—The lens with a field distribution $H(z) = H_0 \exp\{-(z/b)^2\}$ is studied. It is the limiting form of Glaser's representation, $H(z) = H_0/[1+(z/a)^2]^\mu$ as $\mu \to \infty$ [Abstr. 2050 (1944)]. Formulae are derived for the focal-point co-ordinates and the focal distance and these agree more closely with experiment than those of Glaser. The spherical aberration and the resolving power are also calculated, and some experiments are described which allow the spherical aberration to be measured. A new lens having less aberration and more resolving power than a previous one [Abstr. 1361 (1944)] is described. L. S. G.

537.533.72 : 621.385.833 = 3 2451

Calculation of magnetic lenses with a given field distribution. SVARTHOLM, N. *Ark. Mat. Astr. Fys.*, 28*B*, 4, *No.* 16, 8 *pp.*, 1942.—The trajectories of paraxial electrons in the field H of a magnetic lens are investigated for a field distribution along the z axis of the form $H = H_0(1 + z^2/a^2)^{-\mu}$, in which H_0 and a are const. and μ takes integral or half-integral values $\geqslant 1$. The general equation of motion of the electrons is set up and solved. An expression is derived for the focal length of the lens, and is verified experimentally using the constants of an actual lens. [See Abstr. 2050 (1944)]. A. HU.

537.533.72 : 621.385.833 = 3 2452

Neighbouring images associated with electron microscope images. BOERSCH, H. *Z. Phys.*, 121, 11–12, *pp.* 746–753, 1943.—These images, which are often repetitions of the real image, are only observed with crystalline materials. They may be explained as the result of (1) interference in the crystal grating, and (2) image formation that is not perfect. Several photographs are given of such images. L. S. G.

537.533.9 : 771.5 : 621.385.833 = 3 2453

On the intensity conditions in the super-microscope. Communication III. Suitability and limits of sensitivity of photographic plates for super-microscopic photographs. BORRIES, B. VON. *Z. Phys.*, 119, 7–8, *pp.* 498–521, 1942.—[Abstr. 1893 B (1944)].

537.591 : 539.152.1 *see Abstr.* 2458

537.591.1 2454

Separation of electronic and non-electronic components of cosmic radiation by Bhabha's method. AIYA, S. V. C. *Proc. Indian Acad. Sci. A*, 19, *pp.* 177–181, *April*, 1944.—The theoretical predictions of Bhabha [Abstr. 2058 (1944)] that Pb is more effective in cutting out electrons by splitting it in the approx. ratio 1 : 4 (the thinner piece being used for shower production from high-energy electrons and the thicker piece absorbing the low-energy electrons) have been confirmed experimentally by observations at Ootacamund (geomagnetic lat. 1·7° N, altitude 7 200 ft.). Two Pb filters of total thickness 5·25 cm. and 5 counters, 3 connected in coincidence and the other 2 in parallel and in anti-coincidence, were used. The total wt. of the apparatus was 4 oz. The hard component constitutes 66·3% of the total intensity. W. R. A.

538.12 : 523.746 *see Abstr.* 2347

538.213 : 621.3.013.82 2455

Magnetic permeability at very rapid rates of change of induction. GLICK, H. L., AND SIEGEL, S. *Bull. Amer. Phys. Soc.*, *April* 28, 1944.—The permeability of several magnetic materials in the form of a strip 0·003 in. thick or less was measured at rates of change of induction of 10^{10} gauss/sec. The measurements were made from c.r.o. observations of B and H, a square pulse of voltage about 1 μsec. in duration being applied to coils surrounding the sample. During this

pulse, the induction rises linearly. The eddy-current effects present in such a situation have been calculated and the B/H loops observed are in qualitative agreement with those predicted with these calculations from the d.c. magnetic properties, the electrical resistivity, and the thickness of the strip material. Quantitatively, the observed loops indicate a permeability, during the rise of induction, about 30 to 50% lower than the d.c. permeability.

538.3 2456

On Helmholtz's electrodynamical potential and the induction coefficients of unclosed currents in quasi-stationary processes. SILVEIRA, A. DA. *Phil. Mag.*, 35, *pp.* 346–351, *May*, 1944.—A system of (closed or open) conductors in a vacuum is free from electric and magnetic polarization. Expressions are derived for the scalar potential and the vector potential, and these are used to calculate the magnetic energy of a system of currents. Planck's theorem is deduced: in a quasi-stationary process the magnetic energy of a system of unclosed currents i_α can be represented by the formula $\frac{1}{2}\sum_\alpha\sum_\beta L_{\alpha\beta}i_\alpha i_\beta$ provided the definition of the coefficients of induction $L_{\alpha\beta}$ in the case of closed currents be suitably extended. It is shown how to determine the $L_{\alpha\beta}$ in the case of 2 linear currents and an expression is obtained for the coefficient of mutual induction of two open circuits. L. S. G.

538.569 : 548.5 *see Abstr.* 2483

538.615 : 523.774.6 *see Abstr.* 2353

538.63 : 537.11 *see Abstr.* 2439

539.152.1 2457

On Sargent curves for artificially β-active nuclei. CHAUDHURY, P. K. SEN. *Indian J. Phys.*, 17, *pp.* 262–270, *Oct.*, 1943.—Sargent curves of all known, artificially made, β-active nuclei together with naturally β-active nuclei are drawn. From these the approx. spin of some nuclei of even mass-number are deduced.

539.152.1 : 537.591 2458

On the meson-pair theory of nuclear interaction. KLEIN, O. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 3, 13 *pp.*, 1944.—A modification is made of Marshak's heavy-electron-pair theory of nuclear forces [Abstr. 2519 (1940)] in which the heavy electrons (obeying the ordinary relativistic Dirac equation) are replaced by mesons of integer spin and Bose statistics. The results are similar to those of Marshak, whose assumptions, however, while not contradicting the known spin and statistical properties of nuclei, can scarcely be reconciled with the experience regarding the disintegration of mesons in cosmic rays. As in Marshak's theory, there is no indication of the origin of the β-electrons, which is naturally explained by the symmetrical theory of Kemmer [Abstr. 3436 (1938), 1329 (1940)], nor of the non-Dirac magnetic moments of protons and neutrons, especially their opposite sign and approx. equality. To solve these difficulties it would probably be necessary to assume additional interactions in the pair theory. L. S. G.

539.16.08 2459

An automatic Wilson cloud chamber with new illumination and a new type of coil for a homogeneous magnetic field. ZEIPEL, E. VON. *Ark. Mat. Astr. Fys.*, 30*A*, *No.* 2, 27 *pp.*, 1944.—The chamber described is completely automatic and has been designed primarily to investigate electron and positron radiation with energies up to 10 eMV. New methods and constructions have been used for some of the components, particularly the coil producing the magnetic field and the central electro-mechanical control device. The illumination is also obtained by a new method. The new coil produces a magnetic field far more homogeneous than that of the Helmholtz ideal coil. L. S. G.

539.16.08 : 550.42 246

Radium-content of Ceylon thorianite. CHAUDHURY, P. K. SEN. *Indian J. Phys.*, 17, *pp.* 257–261, *Oct.*, 1943.—A pliotron-amplifier was set up for the study of the Ra content by the γ-ray method. The amount of Ra approx. amounts to $5{\cdot}94 \times 10^{-8}$ g. per g. of the mineral.

539.16.08 : 552.5 246

The total gamma-ray activity of sedimentary rocks as indicated by Geiger-counter determinations. RUSSELL, W. L. *Geophysics*, 9, *pp.* 180–216, *April*, 1944.—Counter determinations of the γ-ray intensity of 51 rock samples were made to determine the average radioactivity and frequency distribution of radio activities of the various types of sedimentary rocks. The results show that limestones, sandstones and dolomites are of relatively low radioactivity, shale much higher, and black bituminous shales highest of all. The new data may be used to improve the interpretation of radioactivity logs and to determine the value of surface radioactivity surveys.

539.163.2 246

Radiations emitted by Sc 46. MEITNER, L. *Ark. Mat. Astr. Fys.*, 28*B*, 4, *No.* 14, 6 *pp.*, 1942.—Measurements of the absorption in lead of the γ-radiation emitted by Sc 46 give an exponential decrease with thickness and an absorption coefficient corresponding to γ-radiation of energy $(1{\cdot}5 \pm 0{\cdot}1)$ eMV, with homogeneity of 95%. The discrepancy betw. this value and that of Walke [Abstr. 1095 (1940)] is discussed, and observations with a counter with thinner walls suggest the presence of a soft component. This is shown to consist of β-rays of energy 0·26 eMV but the presence of a group of β-particles at 1·5 eMV reported by Walke, is not confirmed. The bearing of the observations on the nuclear spin of Sc 46 is indicated and a probable disintegration scheme is set up in which the first product of β-disintegration is excited Ti 46. A. HU

539.213.29 : 666.1 246

The behaviour of glass under impact and static loading. HAWARD, R. N. *J. Soc. Glass Technol.*, 28 *pp.* 5–32, *Feb.*, 1944.—Experiments were performed on the strength of glass in the form of beams and plates. The beams, cut from sheet glass approx 0·28 cm. thick, were tested by a slow loading test and by the impact of a pendulum. The squares were tested by pressing a steel ball centrally against the square and by the impact of a falling ball. In slow impact, when using objects heavier than the glass, the energy required to break the glass is > that needed under static conditions. As the velocity of impact is increased, the energy required to shatter a glass plate diminishes. This is ascribed to the operation of

resses, due to the weight of the glass, the initial lue of which is given approx. by the relation $V\sqrt{(E\rho)}$. hen glass is broken by small balls at high velocities, ne or shell fractures are produced, which appear be an extension of the statically formed ring cracks ong lines ⊥ the max. tension in the glass.

39.3 : 677 : 536.212.3 *see Abstr.* 2432

39.31 2464

Simplified method of analysis of reactions developed s expansion in a three-anchor piping system. OCHAK, B. *Trans. Amer. Soc. Mech. Engrs*, 66, . 311–318, *May*, 1944.—The reactions set up by pansion in a 3-dimensional pipe system fixed at points, when determined by existing methods, in- olve 78 coeff. and the solution of 12 simultaneous uations. The author's method reduces the problem a 2-anchor question with 21 coeff. and 6 equations. numerical example is worked out, and the re- tions as determined by the 2 methods are given or comparison. G. E. A.

39.319 : 621.88 2465

Shrink-fit stresses and deformations. RANKIN, . W. *J. Appl. Mech.*, 11, *A77–A85*, *June*, 1944.— xpressions for the stresses in a solid cylinder of nfinite length, caused by the action of an applied radial ress distributed uniformly over a single circum- erential ring of finite length on the surface of the ylinder, are derived. An example of stresses of this ype would be a long solid shaft with a uniform pres- ure applied on the surface for a short axial length; the esults apply to shrink fits. Test measurements of haft deformations due to shrink pressures are in- luded.

39.32 : 548.0 *see Abstr.* 2482

39.384 : 548.73 *see Abstr.* 2489

39.4.019 : 620.178.311.6 : 534.372.08 2466

Measurement of the damping of engineering materials uring flexural vibration at elevated temperatures. CHABTACH, C., AND FEHR, R. O. *J. Appl. Mech.*, 1, *A86–A92*, *June*, 1944.—A tuning-fork specimen s set into vibration by jerking a spreader from he gap between the ends of the tines. The lamping is expressed in terms of the log. decrement f the decaying vibration, which is measured and ecorded by a magnetic oscillograph, amplifiers and resistance-type electric strain gauge cemented to the pecimen. The results include: the damping of a umber of materials during flexural vibration at pprox. 1 000 c./s., at max. bending stresses up to 0 000 lb./in.^{2} and up to 1 400°F.; the variation in odulus of elasticity with temperature, as determined om the specimen vibration frequencies. M.-V.

539.4.019.1 : 620.178.72 2467

Measurement of dynamic stress and strain in tensile- est specimens. FEHR, R. O., PARKER, E. R., AND DEMICHAEL, D. J. *J. Appl. Mech.*, 11, *A65–A71*, *June*, 1944.—The tensile strength, yield strength and breakage energy, of test specimens (cold-rolled steel and dural) were measured while the specimens were being broken by a force applied at a high rate of speed in a commercial high-velocity impact-testing machine. The dynamic tensile strength, the dynamic yield strength and the dynamic breakage energy, were found to be higher than the static values up to the max. impact velocities of these tests (100 ft./sec.). Results of these tests, the technique and analysis used, are described.

539.61 : 541.183 : 532.69 *see Abstr.* 2394

539.621 2468

Surface roughness and sliding friction. BIKERMAN, J. J. *Rev. Mod. Phys.*, 16, *pp.* 53–68, *Jan.*, 1944.—A critical review of experimental work and theories bearing on the cause of friction. Methods of measuring roughness are compared, and the facts for and against the theories of adhesion and roughness are set forth, and the author concludes that Coulomb's decision in favour of the latter is still justified, and that the modern view must be abandoned. G. E. A.

541.123.3 2469

Note on the interpretation of distribution equilibria between molten metals and molten salts. HEYMANN, E., MARTIN, R. J. L., AND MULCAHY, M. F. R. *J. Phys. Chem.*, 48, *pp.* 159–160, *May*, 1944.—[See Abstr. 426 (1944)].

541.123.31 2470

Studies of portions of the quaternary system soda–lime–silica–water at 25°C. KALOUSEK, G. L. *J. Res. Nat. Bur. Stand., Wash.*, 32, *pp.* 285–302, *June*, 1944.—The only solid phases found were $Ca(OH)_2$ and a 4-component gel of variable composition. The boundary, $Ca(OH)_2$—soda-lime-silicate gels, was determined and the compositions of the gels along this boundary shown to vary from 0·003 Na_2O: 2·0 CaO : 1·0 SiO_2 : xH_2O (at 0·2 g. of Na_2O per litre) to about 0·25 Na_2O : 1·0 CaO : 1·0 SiO_2 : xH_2O (at 20 g./l. and extending to 101 g./l. of Na_2O). In regions off the boundary, at selected const. conc. of Na_2O but with increasing conc. of SiO_2 in solution, the Na_2O : SiO_2 molar ratio of the gels varied only slightly from 0·2 in most cases; the CaO : SiO_2 molar ratio, however, decreased to values approaching 0·1 at the max. conc. of SiO_2 used. Interpretations pertaining to relations between the composition of the gels and solutions are given.

541.124 : 541.183.55 *see Abstr.* 2479

541.124.7 : 536.77 2471

Relative free energies and dissociation constants of microscopic ions. HILL, T. L. *J. Phys. Chem.*, 48, *pp.* 101–111, *May*, 1944.—Microscopic dissociation constants and relative std. free energies of microscopic ions may be calculated from experimental dissociation constants for a number of compounds. These results may be used to estimate average effects of charges, in different positions within molecules, on microscopic dissociation constants. Microscopic constants may then be approximated for other compounds for which the experimental data are incomplete. Examples are given. The anomalous dissociation constants of oxalic and malonic acids are discussed.

541.124.7 : 545.37 : 547.96 2472

The combination of fibrous proteins with acids. GILBERT, G. A., AND RIDEAL, E. K. *Proc. Roy. Soc. A*, 182, *pp.* 335–346, *June* 16, 1944.—An approx. titration equation is developed for the reaction between fibrous proteins and acids, in which account is taken of the valency and intrinsic affinities of the acid anions, and of the limited number of adsorption

sites available for anions. The transition from soluble to fibrous proteins is traced in order to demonstrate that the main difference between the titration curves of the two types of protein arises from the difference in potential developed during the adsorption of protons.

541.127 : 541.64 2473

The mechanism of copolymerization. ALFREY, T., JR., AND GOLDFINGER, G. *J. Chem. Phys.*, 12, *pp.* 205–209, *June*, 1944.—The mechanism of catalytic copolymerization of 2 monomers *A* and *B* is treated with the aid of steady-state approximation. Two initiation and 2 termination rates are assumed, 1 for each monomer. Four propagation rates are considered, corresp. to addition of monomer *A* to a chain ending in *A**, or to a chain ending in *B**, and addition of monomer *B* to a chain ending in *A**, or to a chain ending in *B**. Overall rate and number average mol. wt. are calculated. The composition of the polymer and the number distribution curves of groups of submolecules *a* and of submolecules *b* are calculated as functions of the monomer composition and 2 rate-const. ratios.

541.132 2474

Effect of temperature on the electrolytic dissociation in strong electrolytes. I. Nitric acid. RAO, N. R. *Indian J. Phys.*, 17, *pp.* 295–299, *Oct.*, 1943.—Electrolytic dissociation in HNO_3 is studied at various conc. and temperatures by the mechanism of Raman effect. The degree of dissociation of the acid is calculated by comparing the intensity of the line of Raman frequency 1 050 with that of Raman frequency 1 300 in the Raman spectra of the acid at these temperatures. The dissociation of the acid decreases with increasing temperature.

541.134.2 2475

Electrolytic solution pressure of copper wires under strain. GAUTAM, L. R., AND JHA, J. B. *Proc. Indian Acad. Sci. A*, 19, *pp.* 350–354, *Dec.*, 1943.—A systematic study is made of the e.m.f. betw. strained and unstrained Cu wires in $CuSo_4$ solutions of different concentration. The strained wire is always positive. That more work is needed to detach ions from the strained surface than from the unstrained is attributed to interference with ion formation by molecular aggregations produced by the strain. As the load approaches the breaking load, the deformation becomes complete and no further change of e.m.f. occurs. A. HU.

541.138.2 : 669.71 : 621.357.8 2476

Mechanism of electrolytic oxidation of aluminium. ANDERSON, S. *J. Appl. Phys.*, 15, *pp.* 477–480, *June*, 1944.—[Abstr. 1878 B (1944)].

541.182.4 : 532.69 *see Abstr.* 2395

541.182.6 : 532.69 2477

A study of the colloidal system carbon dispersed in xylene. DAMERELL, V. R., AND URBANIC, A. *J. Phys. Chem.*, 48, *pp.* 125–133, *May*, 1944.—Lecithin, Cu oleate, Co naphthenate and Na dioctyl sulphosuccinate, increase the degree of dispersion of C in xylene. These surface-active agents became more effective as the water content of the system was lowered by drying. C dispersed in xylene under these conditions is neg. charged. Cu oleate and Co naphthenate were positively adsorbed by the C, while the ineffective oleic acid was not adsorbed. The dispersed C phase could be partially or completely thrown down by the addition of alcohol or water, by heat, or in an electrical field. A low temperature, down to − 5°C., had no effect. The surface area of the three types of C used was determined by the low-temp. adsorption method, using He and N gas.

541.182.6 : 532.69 2478

Effect of surface-active agents upon dispersions of calcium carbonate in xylene. DAMERELL, V. R., AND MATTSON, R. *J. Phys. Chem.*, 48, *pp.* 134–141, *May*, 1944.—Dispersions of $CaCO_3$ in xylene were made in the presence of a number of surface-active agents, and analysed for particle-size distribution by use of a sedimentation balance and a slit ultramicroscope. The most effective surface-active agents were the Zn, Ba and Na salts of dioctyl sulphosuccinate, Na dihexyl sulphosuccinate, lecithin, and Mg oleate. The organosols had a milky white, opalescent appearance, and were coagulated by water, 95% ethyl alcohol, and diethyl ether. Heat partially coagulated them, but cooling (to 0°C.) did not. The colloidal particles were pos. charged except when lecithin was used as a dispersing agent, in which case both pos. and neg. charged particles were present.

541.183 : 539.61 : 532.69 *see Abstr.* 2394

541.183.55 : 541.124 2479

Kinetic studies on the adsorption of phenol by activated carbon in packed towers. TESI, A. F. *Bull. Univ. Pittsburgh*, 40, *pp.* 303–310, *Jan.*, 1944.—Twenty runs were made in which varying concentrations of phenol solutions were passed through towers packed with activated carbon. The investigation covered a considerable range of concentration, tower height, flow rate and particle size. (1) Adsorption taking place when a solution is passed through carbon-packed towers can be considered analogous to heat transfer, and the mathematical treatment of Schumann as extended by Furnas [*Bull. U.S. Bur. Min.*, p. 1301, 1932] can be applied. (2) The mass transfer coefficient as obtained by the Schumann–Furnas treatment was fairly const. over a wide range of operating conditions. (3) In runs made with tower heights above 17 cm., the relation between efficiency of adsorption and time can be expressed by the modified probability integral equation. (4) The results of this investigation using activated carbon, are very similar to those of Beaton and Furnas [Abstr. 877 (1942)] using zeolite-type adsorbent. H. H. HO.

541.64 : 541.127 *see Abstr.* 2473

541.651 : 535.343 *see Abstr.* 2420

545.37 : 547.96 : 541.124.7 *see Abstr.* 2472

545.82 : 546.815 2480

Spectrographic determination of lead in pectinous materials. JEPPESEN, C. R., EASTMOND, E. J., AND LOGAN, H. G. *J. Opt. Soc. Amer.*, 34, *pp.* 313–318, *June*, 1944.—Describes the spectrographic determination of Pb in pectinous solutions containing 10^{-7} to 10^{-8} g. Pb per g. solution. Contamination by chemical reagents is overcome by ashing, the ash being then burnt in a l.v. d.c. arc. Concentrations of Pb as small as 0·000001% in the original sample, or 0·005% in the ash, are detected and measured. A. H.

46.11 : 535.338 *see Abstr.* 2419

46.815 : 545.82 *see Abstr.* 2480

47.96 : 545.37 : 541.124.7 *see Abstr.* 2472

48.0 : 535.375.5 : 536.631 2481

The evaluation of the specific heat of rock salt by the ew crystal dynamics. DAYAL, B. *Proc. Indian tcad. Sci. A*, 19, *pp.* 182–187, *April*, 1944.—By the laman dynamics of crystal lattices [Abstr. 1877 1944)] the rock salt structure has 9 distinct *vv* of ibration, representing 45 of the 48 deg. of freedom f the 8 Na^{+} and 8 Cl^{-} ions in a super-lattice cell. hese *vv* have been evaluated and agree well with xperimental values from the Raman spectrum. The ther 3 deg. of freedom represent the spectrum of the lastic vibrations of the lattice and are calculable from nown elastic consts. Values of C_v calc. from these ata agree with experimental values. W. R. A.

48.0 : 539.32 2482

Elasticity of a crystal as dependent on temperature. KORNFELD, M., AND SHESTIKHIN, P. *C.R. Acad. Sci. URSS*, 36, 2, *pp.* 52–56, 1942.—A tabular summary of previous results is followed by an account of new measurements of the rigidity modulus of poly- and monocrystalline Sn, pure ice, and impure ice (tap water), and steam. The rigidity modulus was determined from measurements of the velocity of propagation of torsional elastic waves at 3 000 c./s. At the same time, measurements were made of the absorption of elastic waves, this being expressed as the phase angle between strain and stress. The measurements covered the range of temperatures from the m.p. down to about 88°K. A. E. T.

548.5 : 538.569 2483

Electromagnetic-wave crystals. JAPOLSKY, N. S. *Nature, Lond.*, 154, *p.* 20, *July* 1, 1944.—A method of producing artificial diamonds is suggested which consists in causing crystallization to proceed in a space filled with stationary electromagnetic waves with the nodal points corresponding to the positions of the atoms in the crystal.

548.55 2484

A method of growing single crystals of sodium stearate and sodium palmitate. BRETTEVILLE, A. DE, JR., AND RYER, F. V. *J. Phys. Chem.*, 48, *pp.* 154–158, *May*, 1944.—Na stearate can be crystallized only at a critical conc. below the gel point in an alcohol solution. Na palmitate cannot be crystallized below the gel point, but gives crystals on the addition of a pinch of NaCl, which appears to act as a nucleus for crystal growth.

548.73 2485

On the application of the micro-absorption factor to problems of lattice distortion and the nature of anti-phase domains. TAYLOR, A. *Phil. Mag.*, 35, *pp.* 404–414, *June*, 1944.—The dimensions of crystallites in powder specimens can affect considerably the intensities of X-ray reflections in Debye–Scherrer patterns, the absorption factor, A, being given by $A = \tau\alpha$, where τ is the micro-absorption factor for the individual reflecting crystallite and α is the macro-absorption factor, which is an average for the whole specimen. The micro-factor has usually been neglected in X-ray investigations, and erroneous conclusions may therefore have been drawn. The intensities of X-ray reflections of filed metal powders show apparently smaller values of the atomic scattering factors (f), which has been attributed to random displacements of the atoms about their mean lattice positions. It is shown that the dimensions of the reflecting crystallites could give rise to intensity changes of this order of magnitude. Cold-worked Cu and Ni are taken as examples. It is probable that the micro-absorption effect is the real reason for lower f values in cold-worked metal filings. The causes of line-broadening by the superlattice of Cu_3Au are also discussed on this basis. By plotting the ratio of the micro-absorption factors for lattice domains and crystallites, the existence of ordered domains in the lattice of Cu_3Au can be confirmed, or it may be shown that the broadening of the superlattice line is caused by "faulting," similar to that found in the Co lattice. A. J. M.

548.73 2486

Orientation of quartz crystals by X-rays. *Industr. Diamond Rev.*, 4, *pp.* 149–150, *July* 1944.

548.73 2487

Displacement of X-ray reflections. ARUJA, E. *Nature, Lond.*, 154, *p.* 53, *Aug.*, 1944.

548.73 : 535.339 2488

A simple crystal monochromator for X-rays. DONNAY, J. D. H., AND FANKUCHEN, I. *Rev. Sci. Instrum.*, 15, *pp.* 128–129, *May*, 1944.—Describes a simple rayproof monochromator designed for use with the General Electric X-ray diffraction unit. The crystal used is pentaerythritol. J. T.

548.73 : 539.384 2489

X-ray spectrographic investigations of the bent of mica crystals made with the aid of a Johann spectrograph. WAINSTEIN, E. *C.R. Acad. Sci. URSS*, 35, 8, *pp.* 233–235, 1942.—X-ray photographs of bent mica crystals, taken at a distance behind the focus, reveal a pattern of clear-cut mutually shifted reflections. The paper describes observations which support the assumption that these images are associated with separate crystal pieces, turned with respect to one another, formed during the process of deformation. Laue X-ray photographs were obtained, but did not reveal any turning of the lattice. A. E. T.

548.73 : 669.24 2490

The crystal structure of Ni_4Mo. HARKER, D. *J. Chem. Phys.*, 12, *pp.* 315–317, *July*, 1944.—A Ni-Mo alloy containing 20 atom % Mo exists above 900°C. as a cubic close-packed structure. If this alloy is quenched and then held below 840°C. an ordering reaction occurs which results in a slight tetragonal distortion of the cubic structure. This ordered structure requires for its description a tetragonal cell with 2·5 times the vol. of the distorted face-centred cubic cell. The completely ordered structure can be described analytically as follows: space group: $C_{4h}^5 - I4/m$; dimensions of unit cell: $a_0 = 5{\cdot}720$ Å, $c_0 = 3{\cdot}564$ Å, $c/a = 0{\cdot}6231$; atomic positions: 2 Mo in 2(*a*), 8 Ni in 8(*h*), $x = 0{\cdot}200$, $y = 0{\cdot}400$.

548.73 : 669.3 : 669.74 2491

An X-ray study of the copper-manganese binary alloy system. ELLSWORTH, L. D., AND BLAKE, F. C. *J. Appl. Phys.*, 15, *pp.* 507–512, *June*, 1944.—Slowly cooled and annealed samples both give identical

results; Cu enters into a continuous series of solid solutions with Mn, crystallizing in a face-centred cubic lattice with a gradually increasing parameter as the Mn content is increased from 0 to 60%. Above 60%, and up to 90% Mn, the lattice is face-centred tetragonal. Between 90% and 100%, 2 phases are present, one being the solid solution phase corresp. to an alloy with 90% Mn, the other being that of α-Mn.

550.312 : 552.3 : 550.381 *see Abstr.* 2493

550.38 : 551.594.6 : 621.396.11 2492

On the paramagnetic effects influencing the radio-wave propagation in the atmosphere. GINSBURG, V. L. *C.R. Acad. Sci. URSS*, 35, 9, *pp.* 270–273, 1942.—[Abstr. 1991 B (1944)].

550.381 : 550.312 : 552.3 2493

Association of magnetic and density contrasts with igneous-rock classifications. NETTLETON, L. L., AND ELKINS, T. A. *Geophysics*, 9, *pp.* 60–78, *Jan.*, 1944.—Assuming the susceptibility of igneous rocks to be due to disseminated magnetite, the probable intensity of magnetization of 1 450 samples is given on the basis of chemical analyses for magnetite. Density values are also given, and the resulting contrasts are analysed statistically. The results are in reasonable agreement with expectations from the comparison of magnetometer and gravimeter surveys, though the attainment of the Curie point at depths of the order of 12 ml. will cause anomalies in some cases. A. HU.

550.381 : 551.24 2494

Magnetic interpretation. WANTLAND, D. *Geophysics*, 9, *pp.* 47–59, *Jan.*, 1944.—Magnetic anomalies do not always correspond to structural uplifts: examples are given of direct, inverse and distorted correspondence. The magnetic effect of high-susceptibility sediments may obscure that of the basement rock, and the possibility of distinguishing betw. the 2 effects in a magnetic stratigraphy is discussed. Magnetic surveying is of greatest use in the mapping of large regions and the selection of localities which would repay examination by methods of greater resolving power. A. HU.

550.385 : 551.594.51 *see Abstr.* 2505

550.42 : 539.16.08 *see Abstr.* 2460

550.836 2495

Contribution to the foundation of thermal method in prospecting. KOVNER, S. S. *C.R. Acad. Sci. URSS*, 37, 3, *pp.* 98–100, 1942.—Thermal fields were calculated for three typical districts, using methods previously described [Abstr. 1718 (1944)]. For the selected values of thermal constants and for the given profiles, the temperature differences in these examples varied from 0·3° to 2·6°C., which in certain cases can be detected by the usual technique for temperature measurement in wells. A. E. T.

551.24 : 550.381 *see Abstr.* 2494

551.243 : 552.11 2496

Generation of magma by frictional heat. DELURY, J. S. *Amer. J. Sci.*, 242, *pp.* 113–129, *March*, 1944.—The idea that magmas originate in the assumed sub-crustal weak shell of isostatic theory is rejected on the grounds that the crust is strong down to at least 700 km. and that the evidence from composition demands a shallow source. Frictional sources of heat may create magma within the crust, and a mechanism is outlined in which failure of the thick crust brought about by thermal contraction of the earth proceeds outwards, and results in slipping betw. large areas of the outer shell. Magmas are thus created by liquefaction along horizontal faults, and subsequent thermal effects cause regional subsidences which explain major surface deformations. A. HU.

551.501.9 : 551.578.4 = 3 2497

Federal institute for snow and avalanche research at Weissfluhjoch, Davos. BUCHER, E., ARRIGONI, A., AND QUERVAIN, M. DE. *Schweiz. Bauztg*, 123, *pp.* 239–241, *May* 13, 1944.—An illustrated description of buildings and equipment, with sp. ref. to the heating and cooling installations.

551.509 2498

Verification of short-range weather forecasts (a survey of the literature). MULLER, R. H. *Bull. Amer. Met. Soc.*, 25, *pp.* 18–27, *Jan.*; 47–53, *Feb., and pp.* 88–95, *March*, 1944.—Summaries are given of 55 articles published betw. 1884 and 1943 dealing with the methods and results of verifying short-range weather forecasts. Some regard verification as impossible or unnecessary; the others use as criteria either the percentage of hits or this percentage reduced by a quantity corresponding to the hits expected by random prediction, on the basis either of persistence, of climatology or of pure chance. A. HU.

551.509.31 + 551.509.34 2499

Spot forecasting approach to synoptic forecasting. BROOKS, C. F. *Bull. Amer. Met. Soc.*, 25, *p.* 35, *Jan.*, 1944.—To avoid taking insufficient account of diurnal and local factors, it is suggested that spot forecasts should be made before consulting the synoptic map. The action of local wet ground, with high specific heat and latent heat, in delaying cooling, is emphasized. A forecast of rain must include considerations of the diurnal variation of the particular rain-making process involved; insolation affects different processes differently. A. HU.

551.509.34 + 551.509.31 *see Abstr.* 2499

551.515 : 621.396.11 2500

Wireless and weather. BENNINGTON, T. W. *Wireless World*, 50, *pp.* 146–149, *May*, 1944.—[Abstr. 1992 B (1944)].

551.555.1(261) 2501

The cyclonic disturbances of the sub-tropical eastern N. Atlantic. PIERSIG, W. *Bull. Amer. Met. Soc.*, 25, *pp.* 2–16, *Jan.*, 1944.—Four types of pressure disturbance forming in the trade-wind belt of the eastern N. Atlantic are distinguished by means of a systematic review of the Hoffmeyer charts betw. 1881 and 1911. Type 1 is a l.p. area, centred in middle or higher latitudes of the N. Atlantic but extending to 25°N.; type 2 starts as a secondary centred at about 30°N., 30°W.; type 3 is a low near the Canary Is. moving E. or W. along the southern edge of the trade-wind belt; type 4 is a low moving W. from the W. African coast, betw. 5° and 20°N. The weather conditions associated with these disturbances are described, and their tracks, duration, frequency and recurrence tendency are discussed. A detailed synoptic analysis of the type 4 disturbance of Aug. 29–Sept. 2, 1909, is given. A. HU.

551.574.7 : 629.135 2502

A study of ice accretion on aircraft over the Canadian Rockies. BENUM, F. W., AND CAMERON, H. *Bull. Amer. Met. Soc.*, 25, *pp.* 28–33, *Jan.*, 1944.—The conditions of air temperature and stability in which icing occurs on an air-line route over the Rockies in S. British Columbia are investigated. During autumn, winter and spring, icing mostly occurs near 8°F. in air masses of which the potential instability is realized when they are lifted over the mountains. Icing may occur in stable air similarly lifted if its rel. humidity in the lower levels approaches 100%.

A. HU.

551.578.4 : 551.501.9 = 3 *see Abstr.* 2497

551.594.221 : 621.316.933 2503

An eight-year investigation of lightning currents and preventive lightning protection on a transmission system. HANSSON, E., AND WALDORF, S. K. *Trans. Amer. Inst. Elect. Engrs*, 63, *pp.* 251–258, *May*, 1944.—[Abstr. 1841 B (1944)].

551.594.5 2504

Preliminary summary, auroral observations, Meanook, Canada, Dec. 1, 1932, to June 30, 1933.—VESTINE, E. H. *Terr. Magn. Atmos. Elect.*, 49, *pp.* 25–36, *March*, 1944.—Visual observations of aurora made at 0300 and 0500 U.T. are tabulated, giving the form, azimuth, altitude and intensity of the display, the latter estimated both in integrated light and in the light of the green line, using a pocket spectroscope. The observations are compared with contemporaneous ones made at Fort Rae, 800 km. to the N. of Meanook.

A. HU.

551.594.51 : 550.385 2505

On Maris and Hulburt's ultra-violet-light theory of aurorae and magnetic storms. WU TA-YOU. *Proc. Indian Acad. Sci. A*, 18, *pp.* 345–349, *Dec.*, 1943.—The fundamental processes assumed in the ultra-violet-light theory, and the calculations of Mitra and Banerjee [Abstr. 3595 (1939)] are critically examined. The probability of a collision of the second kind, in which a particle above the 450 km. level receives enough energy to give it a velocity of 10 km./sec., is shown to be smaller by a factor of $\sim 10^{12}$ than the theory assumes. The acquisition of a high velocity by means of a 3-body collision with recombining particles is also too unlikely for the process to play any rôle in producing aurorae. An error of method is shown to invalidate the process considered by Mitra and Banerjee, and the time taken to ionize high-flying particles by solar radiation is found to be far greater than the theory requires.

A. HU.

551.594.6 : 523.32 : 525.23 *see Abstr.* 2372

551.594.6 : 621.396.11 : 550.38 *see Abstr.* 2492

552.11 : 551.243 *see Abstr.* 2496

552.3 : 550.312 : 550.381 *see Abstr.* 2493

552.5 : 539.16.08 *see Abstr.* 2461

575.322 : 537.531.9 *see Abstr.* 2446

581.48.03 : 537.531.9 *see Abstr.* 2447

623.5 : 531.566 *see Abstr.* 2384

629.135 2506

Problems of construction and alternate substitutions in wood aircraft. STEVENS, J. M. *Trans. Amer. Soc. Mech. Engrs*, 66, *pp.* 155–159, *Feb.*, 1944.—Problems coincident with the use of wood and plywood in aircraft construction are discussed. A greater use of certain approved alternate wood species in place of spruce and other critical materials is advocated. Specific examples of what can be accomplished in the way of simplifying and standardizing the construction of flat and moulded plywood constructions are presented.

629.135 : 551.574.7 *see Abstr.* 2502

666.1 : 539.213.29 *see Abstr.* 2463

666.24/.25 2507

Coloured glasses. I. The constitution of coloured glasses. II. The colour of glasses produced by various colouring ions. WEYL, W. A. *J. Soc. Glass Technol.*, 27, *pp.* 133–206*T*, *Aug.*, *and pp.* 265–295*T*, *Dec.*, 1943.—Part I of this monograph is concerned with the constitution of coloured glasses and discusses the origin of colour in inorganic substances, the constitution of glass, the replacement of oxygen by other elements in glasses, the acidity and basicity of glasses and their classification according to their chromophores, the constitution of glasses as revealed by colour and fluorescence indicators. Part II concentrates on the colours produced by iron. The influence of the Fe content on the technology of a glass is discussed; this is followed by a survey of the absorption and transmission produced by Fe ions and compounds. Considerable attention is paid to the equilibrium between di- and tri-valent iron in glasses.

A. H.

669.24 : 548.73 *see Abstr.* 2490

669.3 : 621.325.5 : 535.33.03 *see Abstr.* 2415

669.3 : 669.74 : 548.73 *see Abstr.* 2491

669.71 : 621.357.8 : 541.138.2 *see Abstr.* 2476

669.74 : 669.3 : 548.73 *see Abstr.* 2491

677 : 539.3 : 536.212.3 *see Abstr.* 2432

678 2508

Natural and synthetic rubber fibres. Electron microscope studies. HALL, C. E., HAUSER, E. A., LEBEAU, D. S., SCHMITT, F. O., AND TALALAY, P. *Industr. Engng Chem.*, 36, *pp.* 634–640, *July*, 1944.—Electron micrographs are described of fibres and films obtained from Hevea, guayule, Cryptostegia, Buna S and neoprene. One type bears numerous fluid nodules and the other consists of branched networks of beaded fibres. These types are characteristic of the sol and the gel fractions, respectively. Cold vulcanization in solution produces structures resembling those of gel. Suggestions on the nature of carbon black reinforcement are offered on the basis of the electron microscope observations of vulcanized and unvulcanized rubber in which various types of carbon blacks are incorporated.

771.43 2509

The flat spiral reel for processing 50 ft. lengths of film. IVES, C. E., AND KUNZ, C. J. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 349–360, *June*, 1944.—Complete processing units in 30 ft. and 50 ft. sizes were built of stainless steel wire welded to flat radials. Other sizes are possible within limits which are discussed. The 2 mated sides were mounted on a reinforced bakelite hub which provides the bearing for rotation

of the reel and terminates in a handle at one side. Accessory equipment consists of a rewind for loading and unloading the reel, processing and washing tanks, loose water stripper, and drying cabinet. The intensity of agitation which can be given is limited. Consequently, while the uniformity of development is satisfactory for still photographs, it is not suitable for the most exacting motion-picture work, although it may have some application in small-scale motion-picture work.

771.5 : 621.385.833 : 537.533.9 = 3 *see Abstr.* 2453

771.53 2510

Preparation of photographic sensitizers. I. DOJA, M. Q., CHOUDHRY, D. N., AND PANDEY, M. D. *Bull. Patna Sci. Coll. Phil. Soc., No.* 14, *pp.* 50–65, *Jan.*, 1944.—Describes work in progress on the preparation of various sensitizers corresponding to Sensitol green, Orthochrome T and Sensitol red. Full details are given of the chemical processes involved. A. H.

771.53 2511

Photographic sensitizers derived from quinaldine. DOJA, M. Q., AND PRASAD, D. *Bull. Patna Sci. Coll. Phil. Soc., No.* 14, *pp.* 66–75, *Jan.*, 1944.—Describes a new set of sensitizers obtained by using quinolinium, in place of pyridinium compounds. The dyeing, optical, photographic and other properties of these compounds are examined and the chemical processes involved in the preparation are discussed. A. H.

771.53 2512

The cyanine dyes of the pyridine series. III. DOJA, M. Q., AND PRASAD, D. *Bull. Patna Sci. Coll. Phil. Soc., No.* 14, *pp.* 76–86, *Jan.*, 1944.—Describes an attempt to synthesize a uniformly powerful photographic sensitizer useful for panchromatic plates. *p*-diethylamino-benzaldehyde is used and its mol. wt. is increased by substituting the methyl on the tertiary nitrogen atom by larger radicles. Details are given of the chemical processes involved and the properties of the dyestuffs obtained are discussed. A. H.

771.53 2513

Influence of pneumatic pressure on the photographic sensitivity. CHOONG SHIN-PIAW. *J. Opt. Soc. Amer.*, 34, *pp.* 285–289, *May*, 1944.—The effect of pneumatic pressure on photographic sensitivity is investigated. N_2, CO_2 and H_2 were used to produce the pressure. For N_2 and CO_2, application of pressure during exposure lowers the sensitivity, whereas applied before exposure it increases the sensitivity. In the case of H_2, increased sensitivity is found in both cases and this abnormal behaviour is thought due to chemical reaction with the silver bromide of the emulsion. A. H.

771.534 2514

Note on the evaluation of photographic speed from sensitometric data. TUTTLE, C. *J. Soc. Mot. Pict. Engrs*, 43, *pp.* 59–66, *July*, 1944.—Describes an accurate and not laborious mathematical method for the analysis of conventional sensitometric data. The gradient speed of a photographic material is ascertained without the use of special gradient-measuring instruments. The derived formula shows the relation which must exist between density and log exposure at the value of the exposure which is the reciprocal of the speed. A. H.

772 2515

A simplified variable-density sound-negative developer. ZEFF, P., AND TWINING, S. J. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 315–324, *May*, 1944.—A developer composed of Metol, borax and sulphite is described. In a developer so constituted and coupled with an adequate replenisher system, the oxidation factor is negligible and results in a stable *p*H value which in turn permits the elimination of the usual buffering agents. Sensitometric data obtained from the operation of this developer show a negative *H* and *D* characteristic of max. linear latitude, and normal printing characteristics. Gamma-density relationship is very stable during continuous negative developing runs, thus making possible quantity production of sound negatives of uniform density.

778 2516

Recent advances in photographic technique. BAINES, H. *Chem. and Ind., pp.* 346–350, *Sept.* 30 *and Oct.* 7, 1944.—No new results are given in this survey article which deals with improvements in speed and resolving power, new emulsions and their applications, intensification and colour photography. A. H.

778.31 2517

The use of colour filters in photomicrography. PITTOCK, F. J. *Photogr. J.*, 84, *pp.* 219–222, *July*, 1944.—Discusses the practical application of colour filters to the recording of the image of microscopic specimens by transmitted light, the photography of opaque objects by reflected light not being considered. The reasons for using colour filters are dealt with and a number of practical points of general interest are discussed. A. H.

778.533.6 2518

A high-speed cinematograph camera. HENRY, P. S. H. *J. Sci. Instrum.*, 21, *pp.* 135–141, *Aug.*, 1944.—A camera is described capable of taking 120 pictures at rates up to 1 500 per sec. The photographs are taken on std. 35 mm. film carried on a rotating drum; and the illumination is provided by a series of sparks in air. The pictures provide their own accurate time base.

778.534 2519

The new Acme-Dunn optical printer. DUNN, L. S. *J. Soc. Mot. Pict. Engrs*, 42, *pp.* 204–210, *April*, 1944.—Full details are given of an optical printer of radically new design and construction. In addition to the usual optical printing effects, it can make automatically driven dolly or "zoom" shots at any practical speed, make horizontal or vertical frame slide-off effects, wipe off in any direction at any speed and do frame combination printing. A. H.